OCTOBER 2021

# Water Management

## Technical Manual

WAVERLEY
COUNCIL

# Table of Contents

# Key Acronyms

| | |
|---|---|
| **AEP** | Annual Exceedance Probability |
| **ARI** | Average Recurrence Interval |
| **ARMCANZ** | Agriculture and Resource Management Council of Australia and New Zealand |
| **ANZECC** | Australia and New Zealand Environment and Conservation Council |
| **AS** | Australian Standards |
| **BASIX** | Building and Sustainability Index |
| **BOD** | Biological Oxygen Demand |
| **cfu** | colony forming units |
| **COD** | Chemical Oxygen Demand |
| **DCP** | Development Control Plan |
| **DEC** | Former NSW Department of Environment and Conservation* |
| **DEUS** | Former NSW Department of Energy, Utilities and Sustainability* |
| **DGTS** | Domestic Greywater Treatment System |
| **DLG** | NSW Department of Local Government |
| **DNR** | Former NSW Department of Natural Resources* |
| **EPA** | NSW Environment Protection Authority |
| **EPHC** | Environment Protection and Heritage Council |
| **EHPG** | Environment and Health Protection Guidelines |
| **ESCP** | Erosion and Sediment Control Plan |
| **GDD** | Greywater Diversion Device |
| **GP** | gross pollutants |
| **hr** | hour |
| **kL** | kilolitres |
| **l** | litres |
| **LPOD** | legal point of discharge |
| **LGA** | local government area |
| **m** | metres |
| **mg** | milligrams |
| **mm** | millimetres |
| **NATA** | National Association of Testing Authorities |
| **OSD** | on-site stormwater detention |
| **OSR** | on-site stormwater retention |
| **PSD** | permissible site discharge |
| **SCCG** | Sydney Coastal Councils Group |
| **SEPP** | State Environmental Planning Policy |
| **SS** | suspended solids |
| **SWMP** | Soil and Water Management Plan |
| **TP** | total phosphorus |
| **TN** | total nitrogen |
| **TSS** | total suspended solids |
| **WSUD** | Water Sensitive Urban Design |

* These functions are currently undertaken by the NSW Department of Environment and Climate Change (DECC) and the NSW Department of Water and Energy (DWE).

# Glossary of terms

| | |
|---|---|
| **Annual Exceedance Probability (AEP)** | The probability that a given rainfall total accumulated over a given duration will be exceeded in any one year. Example, if a peak flood discharge of 500 $m^3/s$ has an AEP of 1%, it means that there is a 1% chance (that is one-in-100 chance) of a 500 $m^3/s$ or larger event occurring in any one year. |
| **Australian Height Datum (AHD)** | Is a common national plan of level corresponding approximately to the mean sea level. |
| **ARR 1987** | Australian Rainfall and Runoff: 1987 published by the Institute of Engineers, Australia. |
| **ARR 2019** | Australian Rainfall and Runoff 2019 published by the Commonwealth of Australia (Geoscience Australia). |
| **Average Recurrence Interval (ARI)** | The average time interval (expressed in years or fraction of years) between recurrences of a rainfall event of a given intensity and duration. For example, floods with a discharge as great as, or greater than, the 20-year ARI flood event will occur on average once every 20 years. ARI is another way of expressing the likelihood of occurrence of a flood event. |
| **Best Management Practice** | The design of a stormwater treatment measure in accordance with most current best practice guidelines. |
| **Blackwater** | Wastewater generated from toilets. |
| **Detention** | Refers to the holding of stormwater for short time periods aimed at reducing peak flows. The detained stormwater is released to the stormwater system following the peak flow event. |
| **Freeboard** | A margin of safety applied to calculations that estimate the water surface during a storm event. The freeboard accounts for the inaccuracies in calculation methods. The height between water level and the underside of a structure or top of an embankment/channel wall is referred to as freeboard. |
| **Greywater** | Wastewater generated from hand basins, showers, laundries and kitchens. |
| **Groundwater** | Water contained within the voids and spaces in rocks or soils. |
| **Hydraulic Grade Line Analysis (HGL)** | A set of hydraulic calculations or software outputs defining the position of the peak HGL along a drainage pipe during storms of a given AEP. The HGL indicates the depth to which water will rise in the system, and the pressures on pipes. |
| **Impervious** | A surface that does not allow water to infiltrate into the ground, including roofs, roads, pavements, hard surfaced sports courts, any "sealed" areas and permanent water bodies such as swimming pools. |
| **Infiltration** | The downward movement of water from the surface to the subsoil. |
| **Interallotment Drainage** | Common stormwater drainage system that serves one or more private properties. |
| **Land Application System** | An ecologically sustainable method of applying treated or untreated wastewater to land which also does not cause an additional public health risk nor detracts from the local amenity of the area. |
| **Maintenance Schedule** | A set of operating instructions for prospective property owners or occupiers setting out the routine maintenance necessary to keep a site's stormwater system working properly. |
| **Non potable water** | Water that is to be used for non drinking purposes such as toilet flushing, laundry use, garden watering, car washing, etc. |

# Glossary of terms

| | |
|---|---|
| **On-site Detention (OSD)** | Detention of water on-site (refer to Detention). |
| **On-site Retention (OSR)** | Retention of water on-site (refer to Retention). |
| **Overland flow path** | The path that stormwater may take if the piped or channeled stormwater system becomes blocked or its capacity exceeded. Overland flow paths provide a fail safe system to ensure that stormwater is not likely to cause flood damage. |
| **Peak Flows** | The maximum instantaneous outflow from a catchment during a storm event. |
| **Permeable Paving** | Paving materials that allow infiltration into the soil. |
| **Permissible Site Discharge** | The maximum discharge from the site during a 20% AEP storm event under pre-development (existing) site conditions. |
| **Pervious** | A surface that permits water to infiltrate into the ground. |
| **Positive Covenant/ Restriction of Use** | A legal obligation placed on a property title requiring owners to repair and/or maintain a site's stormwater system or dedicated overland flow paths. |
| **Potable water** | Water that may be consumed. |
| **Pump-out systems** | A system comprising pumps and pipes to convey stormwater from a stormwater sump or storage to a gravity draining stormwater system. |
| **Roofwater** | Rain (water) that falls on the roof of a building. |
| **Retention** | The storing of a form of water for use. Can apply to all forms of water including rainwater, stormwater and recycled water. May occur by storing water in a tank or by infiltration. |
| **Runoff** | Interchangeable with stormwater (see Stormwater). |
| **Sewage** | Any form of wastewater (refer to Wastewater) connected to the sewerage system. |
| **Soil & Water Management Plan (SWMP)** | Strategies and controls for a development or site to prevent pollution of the environment from all pollutants during the construction stage. |
| **Stormwater** | Rainfall that is concentrated after it runs off all urban surfaces such as roofs, pavements, carparks, roads, gardens and vegetated open space and includes water in stormwater pipes and channels. |
| **Subsurface irrigation** | Application of water below the soil surface. |
| **Sump** | A cavity or depression where water drains to and which may then be pumped out. |
| **Survey plan** | A plan prepared by a Registered Surveyor which shows the information required for the assessment of an application in accordance with the provisions of this Manual. |
| **Water Sensitive Urban Design** | A design approach promoting sustainable management of the total water cycle through the ecologically sensitive design of homes, streets (and their drainage systems) and whole suburbs. |
| **Wastewater** | Greywater and blackwater (see Blackwater). |
| **Work-As-Executed Drawing (WAED)** | A plan showing the levels, dimensions and location of what is constructed. In the context of this Manual, the plan refers to the stormwater drainage system including any OSD, infiltration, pump out, rainwater harvesting system and where applicable, any overland flow paths. *Note: The WAED must be prepared by a Registered Surveyor and certification provided by a suitably qualified and practising Engineer.* |

# 1.0 Introduction

# 1.0

# Introduction

The Water Management Technical Manual (WMTM) serves to provide standalone technical guidelines to the community, developers and Council for matters relating to water management. It contains planning controls relating to the management of all aspects of the water cycle in an integrated and consistent manner. The planning controls promote the need for long-term sustainable social, ecological and economic outcomes. This manual is not intended be a standalone document and must be read in conjunction with relevant instruments, policies, codes, industry guidelines and standards.

This applies to all types of developments.

## 1.1 Objectives

**This manual is intended to result in developments that:**

a) Reduce peak flows through Council's drainage system;

b) Provide drainage systems that integrate into Council's existing drainage network with minimal impact on existing users;

c) Minimise the risk of flooding increasing within the property or at any adjacent or downstream properties;

d) Improve the quality of stormwater runoff;

e) Protect and conserve the environment, specifically the receiving waters of catchments;

f) Protect the quality and quantity of water conveyed through the receiving trunk drainage systems and waterways;

g) Preserve and protect the health, amenity and property of residents and the community;

h) Minimise public infrastructure capital and ongoing maintenance costs;

i) Plan, implement and maintain the stormwater system in accordance with the principles of Ecologically Sustainable Development (ESD);

j) Support best planning management practices; and

k) Ensure that an integrated and consistent approach to water cycle management is achieved by adopting Water Sensitive Urban Design (WSUD) principles.

**This manual also intends to:**

a) Encourage the development of high-quality stormwater management plans that can be quickly assessed; and

b) Provide a clear understanding of the specifications and documents that must be lodged with the stormwater management plans.

## 1.2 What Sections Apply to my Development?

**The table below provides an overview of the application and is intended to direct the reader to the relevant sections in the WMTM. The WMTM can be found on Council's website.**

| | Application | Section |
|---|---|---|
| **Submission Requirements** | All Development Applications | 3.0 |

| Stormwater Disposal Options | Characteristics of the Development Site | Reference |
|---|---|---|
| **Connection to Council's Kerb and Gutter** | • PSD is less than 25 L/s;<br>• Slopes to the street;<br>• Slopes to the rear but is draining through a drainage easement. | 4.1 |
| **Connection to Council's Below Ground Drainage System in the Road Reserve** | • PSD exceeds 25 L/s;<br>• When the property discharge line is greater than 100 mm DIA. | 4.2 |
| **Private Drainage Easements (Inter-Allotment Drainage)** | • Falls away from the street and no Council pipe exists within the property but the downstream property owner(s) agrees to a proposed easement;<br>• Development site is burdened by an existing easement to drain water and the development has the legal right to connect into the system. | 4.3 |
| **Discharging to Council's Drainage System Passing Through Private Property** | • A Council owned drainage system passes through the development site;<br>• A Council owned drainage system passes through an adjacent property. | 4.4 |
| **Discharging Through Council Owned Land** | • Development falls away from the street and it adjoins a public reserve. | 4.5 |
| **Discharging to a Watercourse** | • When discharging to a suitable natural waterway or creek is permitted by Council. | 4.6 |
| **Infiltration Systems** | • Developments that fall away from the street and is identified to be on land suitable for infiltration (refer to the Infiltration Map on Annexure B);<br>• Where an easement cannot be obtained (evidence must be provided). | 4.7 |

| Stormwater Disposal Options | Characteristics of the Development Site | Reference |
|---|---|---|
| **Charged Lines** | • Developments that fall away from the street and is not on land identified to be suitable for infiltration (refer to the Infiltration Map on Annexure B);<br>• Falls away from the street and no Council pipe exists within the property and an easement cannot be obtained (evidence must be provided);<br>• Single dwelling and Alterations and Additions only where no OSD is required.<br>*Note: Charged systems on Council land will not be permitted in any circumstances.* | 4.8 |
| **Pump Out Systems** | • All other stormwater disposal options are not practical.<br>*Note: This is Council's last resort option and evidence will be required demonstrating that a pump out system is the only viable option.*<br>*Council shall be indemnified from all claims for damages arising from the failure of the pump out system. Evidence of documentation shall be submitted to Council.* | 4.9 |
| **Design Requirements** | All developments lodging a Development Application | 5.0 |
| **Stormwater Systems** | | |
| **On-site stormwater detention (OSD)** | • Refer to Section 6. | 6.0 |
| **Roofwater harvesting** | • All developments<br>• Where roofwater harvesting is proposed. | 7.0 |
| **Stormwater harvesting and re-use, permeable surfaces and paving** | • Where stormwater re-use is proposed.<br>• Where permeable paving is proposed. | 8.0 |
| **Stormwater quality** | All development applications. | 9.0 |
| **Seepage /dewatering** | All development applications. | 10.0 |
| **Other Systems** | | |
| **Groundwater extraction & use** | Where groundwater extraction and use is proposed. | 11.0 |
| **Greywater reuse** | Where greywater re-use is proposed. | 12.0 |
| **Blackwater reuse** | Where blackwater re-use is proposed. | 13.0 |

## 1.3 Relationship with the BASIX SEPP

The introduction of the Building and Sustainability Index (BASIX) State Environmental Planning Policy (SEPP) which applied to all residential development from 1 July 2006 means that any 'competing provision' in a development control plan (i.e. a provision aimed at reducing potable water supply) has no effect.

This document however provides guidelines to assist applicants who want to make informed decisions on the issue of water cycle management. It can apply, therefore, to all development in the Waverley Local Government Area.

# 2.0 The stormwater drainage pipes owners are responsible for

# 2.0

# The stormwater drainage pipes owners are responsible for

**Each property owner is allocated a location to discharge stormwater from their property. Examples include:**

a) Discharging to a Council owned pipe/pit situated underground in the public domain;

b) Discharging to a Council owned pipe/pit located within private property; or

c) Discharging to Council's street gutter via a kerb outlet.

This discharge location is known as the legal point of discharge (LPOD). Any drainage issue past this point is Council's responsibility.

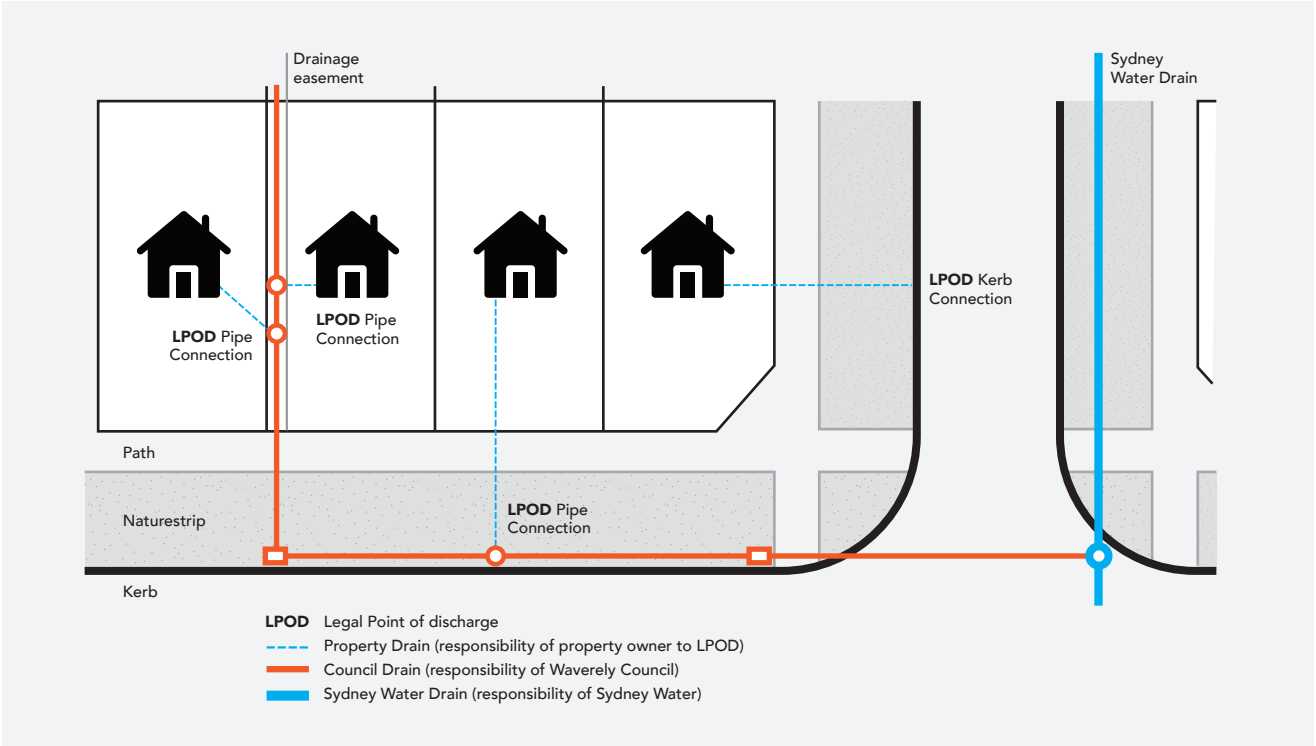
All drainage infrastructure associated with the drainage of private properties is the responsibility of the property owner.

This includes sections of pipe that discharge stormwater to the LPOD or in other words, the section of pipe situated in the footpath, nature strip or road reserve that discharge stormwater to the kerb and gutter or pipe connections to a Council drain.

The property owner is responsible for ensuring that stormwater pipes are connected to the nominated LPOD and that their stormwater runoff does not impact other property owners.

If a property owner suspects an issue with the drainage pipe (for example, a blockage), it is suggested that a licensed plumber be engaged to investigate.

**Legal Point of Discharge**




All property owners have legal obligations to capture, collect and dispose of stormwater from all hard surfaces, through underground pipes to the Council nominated LPOD to prevent a nuisance to adjoining property owners. In general, your neighbour is responsible for controlling stormwater runoff from their property. Water flowing from hard surfaces, such as paving or roofing, should be collected and discharged in an approved manner. Problems with natural overland stormwater flow between neighbouring properties are generally a civil matter to be resolved between the respective owners.

# 3.0 Submission requirements

# 3.0

# Submission requirements

**All developments are required to demonstrate that stormwater runoff from the site is collected and conveyed to an LPOD without adversely impacting adjoining or downstream properties in accordance with these guidelines. Developments that have an adverse impact on adjoining/surrounding properties in relation to the following issues will not be approved:**

(a) Changes in site levels that impede, divert or concentrate natural surface flows from upstream properties; and

(b) Concentration of surface or piped flows onto an adjoining property/s without an appropriate easement.

## 3.1 Stormwater Concept Plan

A Stormwater Concept Plan is needed to support the Development Application (DA) for a proposed development. The aim is to identify the property's drainage constraints and to demonstrate that the proposed on-site stormwater drainage system can be supported.

**The Stormwater Concept Plan shall be prepared by a suitably qualified and practising Engineer and include:**

a) A Survey Plan prepared by a Registered Surveyor showing boundaries, detail of existing features of the site including all buildings, other structures, trees, driveways, pathways, grass and landscaped areas, utility services within and in the vicinity of the site and in front of the property (street), any easements, contours and spot levels;

b) A proposed layout of the site including the location of all buildings, other structures, trees and landscaped areas, identifying all pervious and impervious areas as well as surface flow paths and the location of the proposed on-site stormwater drainage systems;

c) Method of draining the site including the location of the connection to Council's stormwater system, if applicable. The location and method of discharge to natural areas such as bushland and waterways are to be identified;

e) Concept roof drainage design;

f) Any existing or proposed Council or private drainage easements or stormwater infrastructure within or adjoining the site;

***Depending on the development scale, a stormwater management plan may not be required at DA stage. However, it is strongly recommended that a Stormwater Concept Plan is submitted with a DA.***

g) Drawings to scale depicting the location, size and dimensions of drainage components including OSD systems, pump out systems, rainwater systems and infiltration systems;

h) OSD details such as storage location, dimensions, design levels of the storage including the orifice level, top water level and ground levels, cross sections, volume calculations and orifice size calculations and details; and

i) A Soil and Water Management Plan is to be lodged with the Development Application. The plan is to detail the measures that will be provided to manage erosion, sediment control and water during development. The plan is to be consistent with the objectives and controls as detailed in 'the Blue Book' (Landcom, 2004).

Any proposal to utilise an infiltration system as the primary method of stormwater discharge must submit a geotechnical report for assessment with the DA. The proposed location and extent (including cross-sections) and supporting calculations shall be provided.

Generally, a Stormwater Concept Plan may be sufficient at the DA stage. A Stormwater Detailed Plan must be submitted for approval by Council prior to the Construction Certificate (CC) being issued (see Section 3.3).

**However, at Council's discretion, applicants may be required to lodge a Stormwater Detailed Plan at DA stage for designs that include one or more of the following:**

a) OSD;

b) Infiltration;

c) A Charged System;

d) Pump Out System;

e) Drainage to an existing or proposed inter-allotment drainage easement;

f) A site identified as flood affected.

## 3.2 Stormwater Detailed Plan

**A Stormwater Detailed Plan is required to support the assessment process. The Stormwater Detailed Plan shall be prepared by a suitably qualified and practising Engineer and include:**

a) All information required for a Stormwater Concept Plan as stated in Section 3.1.

b) Design plans and supporting documentation showing:
   (i) Location and extent (including cross sections) of storages, management measures and discharge control devices;
   (ii) Full OSD design including layout, proposed construction materials, detailed level design, and full orifice details;
   (iii) Clear identification and quantifying of any pervious and impervious areas that bypass the OSD system and how these areas are to be drained;
   (iv) Calculations of sizing the proposed absorption or infiltration system as well as sections. Associated documentation including a geotechnical investigation report must be submitted to Council;
   (v) Calculations demonstrating the sizing of pump out systems in accordance with Section 4.9 of this manual and Section 8 of AS/NZS 3500.3;
   (vi) Calculations demonstrating the practicality of a charged system;
   (vii) Catchments draining to proposed management measures;
   (viii) Maximum water surface levels and surcharge paths;
   (ix) Internal drainage system details including location of downpipes, surface channels, kerbs, pits, pipes and sub-surface drainage and supporting calculations;
   (x) Detailed roof drainage design including calculations;
   (xi) Type, invert and surface levels of inspection openings and pits, sizes, types and gradients of pipes and finished surface levels of paved and landscaped areas;
   (xii) Floodway / flow path extent with levels shown on the plans. Information relating to overflow paths shall include contours of the land within which the overflow path will be located, overflow path cross sections and details of ground surfaces (such as surface types, e.g. grass); and
   (xiii) Full details of any notification and warning signage required and details of its permanent fixing. See Annexure L for examples of standard warning signage.

c) Details of the connection to Council's below-ground stormwater drainage system including the location and levels of the point of connection (kerb, public or private pipe/pit or a natural area). When a connection is proposed to Council's drainage system, a long section of the connection and its details including existing services crossing, the clearance to any services, surface levels, obvert levels and invert levels must be provided.

d) When the proposed development is located in a flood affected area, or discharges into a stormwater pipe, channel, or natural water body, a Hydraulic Grade Line Analysis that recognises the effect of downstream controls shall be provided. The 1% AEP flood levels of the external system are to be used for this purpose.

e) Location of drainage easements within or near the development site including any stormwater infrastructure details.

## 3.3 Review of the Stormwater Management Plan Prior to the Issue of a Construction Certificate

Council is required to review and approve all stormwater management plans (unless advised otherwise) prior to the Construction Certificate being issued. A fee is payable for this service (refer to Council's Pricing Policy and Schedule of Fees and Charges).

*It is strongly advised that Sections 3.1 and 3.2 are read to ensure that the Development Application is not delayed or refused from a stormwater management or flooding perspective. Annexure C contains a checklist which must be submitted to Council. Failure to provide the checklist may lead to the submission being deemed incomplete.*

## 3.4 Post Development Approval Process

### *3.4.1 Works within Public Road Reserve to install Piped Connection to Street Gutter*

Developments that require a drainage connection to the street gutter usually require excavation or other work within the footway or carriageway of the road reserve. Work must not be carried out in a public road unless consent has been granted by the Council (or other relevant roads authority such as NSW Roads and Maritime Services) under the Roads Act 1993. A person wishing to undertake such work must obtain a Road/Footpath Opening Permit from the Roads Authority, usually Council, for routine works such as connection to the kerb and gutter across a nature strip for a single domestic drainage connection.

It should be noted that approval for carrying out works in a public road or footway is granted separately to a development consent or Complying Development Certificate.

### *3.4.2 Works on Council's Stormwater Infrastructure*

Any modifications or connections to Council's stormwater drainage system (i.e. the drainage pit / pipe system) are required to be assessed and approved by Council. This approval is granted separately by Council to a Development Application Consent or Complying Development Certificate.

> *Note: Council's engineers may require additional design, information or reports including, but not limited to, peg-outs of stormwater infrastructure, CCTV of Council's drainage system, and flood modelling to allow for assessment of the proposal.*

### *3.4.3 Inspections on Private Property*

**The applicant is required to engage a suitably qualified and practising Civil Engineer to inspect the stormwater drainage works throughout the construction process. Once all drainage works are completed, the certifying Engineer must ensure:**

a) The stormwater disposal method is in accordance with the approved stormwater management plan;

b) The OSD system is sized in accordance with the approved stormwater management plan;

c) Rainwater tank systems and connections from these systems for reuse have been installed and are compliant with BASIX requirements along with any additional requirements detailed in the development consent and this manual;

d) Any infiltration systems are sized and have been constructed in accordance with the approved stormwater management plan;

e) Pits and pipes are clean and are free draining, pipes are cut flush and do not protrude into pits and benching is provided at the bottom of pits;

f) Orifices are secure and correctly sized and located, and trash screens have been installed as detailed;

g) All design details are according to approved plans;

h) All roof and hard paved areas have been drained in accordance with the approved stormwater management plan; and

i) Any required warning signs are permanently fixed and detail the correct information.

### *3.4.4 Work-As-Executed Drawing (WAED) and Certification*

Works-As-Executed drawing(s) for the stormwater drainage system shall be prepared by a Registered Surveyor demonstrating that adequate storage capacities, finished surface levels and pit and pipe invert levels have been provided in the constructed system.

Certification is to be provided by a suitably qualified and practising Engineer that the built stormwater drainage system will function in accordance with the approved stormwater management plan, the Development Consent, and all applicable Codes, Policies, Plans, Standards and good engineering practice.

Where the built system varies from the Council approved plans, the plans shall be marked-up in red ink and shall include levels and location for the drainage structures and works. In addition, the certifying Engineer shall certify that these variations will not impair the performance of the built management measures, provide details of any remedial works required to make the system function according to the required design standard, satisfies Council requirements in this document and complies with all applicable Codes, Policies, Plans, Standards and good engineering practice.

A copy of all documentation shall be submitted to Council.

### *3.4.5 Maintenance Schedules*

A maintenance schedule is to be prepared by the certifying Engineer that details the components of the stormwater system. The schedule is to include the required maintenance and frequency for each component to allow the system to function effectively. A copy shall be submitted to Council.

### *3.4.6 Compliance Certification*

Where noted in the DA Consent or in the Approval Letter issued by Council (after the assessment of the stormwater management plan has been undertaken prior to the Issue of the Construction Certificate), a Compliance Certificate shall be obtained from the certifying Council Engineer.

### *3.4.7 Creation of Restriction on Use of the Land and Positive Covenant*

To ensure that an on-site stormwater drainage system is not altered during the life of the development, a Restriction on Use of Land is created. This prevents owners making changes to any of the site drainage components which would alter the way the on-site facilities work, without the permission of Council. To ensure that the on-site stormwater drainage system is adequately maintained, a Positive Covenant is registered on the title of the property which places the responsibility for the maintenance on the owner of the land. By registering the covenant and restriction on the property title, the obligations will be transferred to future owners. The Positive Covenant is to be stated to benefit Waverley Council.

A sketch plan showing the location of the various components of the on-site stormwater drainage system and a copy of the maintenance schedule must be included as attachments to the Positive Covenant. This will ensure future owners are aware of their maintenance obligation.

The creation of a Restriction on Use of the Land and Positive Covenant over the on-site stormwater drainage system and its registration with Land Registry Services shall be undertaken prior to the issue of an Occupation Certificate for the site. It should also be noted that only in exceptional circumstances shall Council permit deferral of the construction of the on-site stormwater drainage systems.

***A Restriction on the use of land prevents the system being modified without consent from Council while a Positive Covenant requires the owner/resident to regularly maintain the system.***

**A Restriction on Use of Land and Positive Covenant will be required for developments that have stormwater systems that include one or more of the following:**

a) OSD;

b) Pump-out system;

c) Any system that includes an infiltration system that is the primary method of draining the site;

d) Stormwater Quality Improvement Device.

Council will also require a creation of Restriction on Use of the Land and a Positive Covenant to allow for the preservation and maintenance of any designated overland flow path through the site.

The terms and conditions are to be in accordance with the development consent.

Standard terms and conditions to be used for Restrictions on Use of the Land and Positive Covenants in relation to OSD, pump out or infiltration systems and overland flow paths are presented in the Annexure of this manual. Council may require these terms and conditions to be altered in some instances.

# 4.0 Stormwater disposal options

# 4.0

# Stormwater disposal options

Various methods can be utilised to discharge stormwater from a property. Council's preference is a gravity fed drainage system. However, due to different constraints, this may not always be possible.

When proposing an infiltration, charged or pump systems on low level properties (i.e. developments that fall away from the street), evidence must be submitted to Council that an honest and reasonable attempt has been made to acquire an easement through any of the downstream properties or demonstrated that all avenues to establish an easement be impractical or unviable.

Applicants must first approach all downstream property owners wherever a drainage easement to drain the subject property could be established. Any request for a drainage easement must outline details of the proposed easement, the consequences of an alternative drainage system failing and present a monetary offer of compensation for the easement. The written request is to be generally in accordance with the proforma letter contained in Annexure N. Council requires some written evidence to clarify that some negotiation has been undertaken with the property owner.

Where a neighbouring owner refuses to grant a drainage easement, the applicant must provide documentary evidence of this outcome.

Section 88K of the Conveyancing Act 1919 allows for the compulsory acquisition of an easement over land if the easement is reasonably necessary for the effective use or development of other land that will have the benefit of the easement. There are several criteria outlined in the Act that must first be satisfied. If the property owner cannot attain any written response from the adjacent downstream property owner, a Statutory Declaration stating the above must be submitted.

*Note: Any costs associated with investigating or establishing the easement are the responsibility of the applicant. The applicant is responsible for negotiating with the downstream property owner to obtain a private drainage easement. It is not Council's role or within Council's jurisdiction to adjudicate on amounts of compensation. It is recommended that independent legal advice be sought.*

When attempting to obtain an easement from a downstream property owner(s), please provide Council's Frequently Asked Questions sheet available on its website.

***For larger developments or developments in areas with known drainage problems, Council may require the applicant to pursue the acquisition of a drainage easement through Court.***

## 4.1 Connection to Council's Kerb and Gutter

a) Where the total stormwater discharge from the site does not exceed 25 litres per second (L/s), stormwater may be connected to the street kerb and gutter in accordance with the following requirements:

(i) Gravity systems must be designed in accordance with Australian Rainfall and Runoff 2019, *AS/NZS 3500.3 Plumbing and Drainage – Part 3: Stormwater Drainage*, and, installed and maintained in accordance with the WMTM.

(ii) The minimum internal diameter of stormwater pipes on private property connected to the kerb is 100 mm uPVC. Where the diameter exceeds 100 mm, please refer to Section 4.2.

(iii) Discharge points to the kerb must use the following galvanised steel box-section equivalent to pipe diameters as follows:

a. 100 mm DIA outlet pipe – use 1 x 125 mm x 75 mm x 4 mm (w x h x t)

(iv) Discharge to the street gutter will be limited to two outlet points, to be located directly in the front of the site. Where two outlets are proposed, a minimum clear separation of 200 mm is to be provided at the kerb.

(v) A boundary silt arrestor pit (minimum 450 mm by 450 mm) shall be provided for any stormwater outlet discharging from the site. The silt arrestor pit is to be wholly within the property boundary and frequently maintained by the property owner.

(vi) Piped drainage within all Council land including roads and footways shall be laid at minimum 1% gravity fall directed toward the point of discharge. Charged systems on Council land will not be permitted in any circumstances.

(vii) The peak velocity of water being discharged to the kerb must not exceed 2.0 m/s.

(viii) At the point of connection into the kerb, the invert of the pipe must match the invert of the kerb. The kerb is to be restored at the point of connection.

(ix) Please note at its discretion, Council may request stormwater to be discharged into a below ground drainage system.

## 4.2 Connection to Council's Below Ground Drainage System in the Road Reserve

**Where stormwater discharge from the property exceeds 25 L/s, all stormwater must be connected directly to a below ground drainage system (and not to the kerb) in accordance with the following:**

a) The design and construction of any direct connection to the Sydney Water below ground drainage system must be approved by Sydney Water.

b) All connections to Council's below ground drainage system shall occur at a stormwater pit for pipe diameters greater than 100 mm. If no such pit exists adjacent to the site, then a new grated kerb inlet/access pit will need to be installed over the existing Council pipeline at the applicant's expense.

c) Where required, any extension of Council's existing below ground drainage system will be undertaken at the applicant's expense.

d) The design requirements are listed in Section 5.8. Where design requirements cannot be adhered to due to the nature of the existing infrastructure downstream, the downstream infrastructure may need to be redesigned and reinstated in accordance with Section 5.8.

e) Before and after the connection is made to Council's below ground drainage infrastructure, closed-circuit television (CCTV) footage and a report on the condition of the system will be required.

f) Note: The combined maximum discharge from all connections to the street kerb and gutter and to the below ground stormwater system is not to exceed the permissible site discharge (PSD).

## 4.3 Private Drainage Easements (Inter-Allotment Drainage Systems)

Where the development site falls away from the street and no Council pipe exists within the property, an easement to drain over downstream properties will be required to drain the development. The easement shall be located on the lowest side of the site.

The system shall be designed to sufficiently convey all runoff from the development site and cater for flows up to and including the 1% Annual Exceedance Probability (AEP) storm event.

When the system is proposed through multiple properties, the system shall be designed to cater for any additional flows that can be potentially directed into the system from those properties.

Pits shall be located at the downstream end of the system and within the development site and at the downstream end of the system within each downstream property.

The consent of downstream property owner/s agreeing to the easement/s must be obtained prior to lodgement of a Development Application (incl. s4.55 and s8.3 applications).

Details of the proposed easement and drainage works must be shown on the Stormwater Detailed Plan.

A proposed easement must be clear of any structures (e.g. buildings, retaining walls, eaves, gutters etc.) and trees. Where encroachment into tree root protection zones may exist, the applicant shall provide technical construction details on how a pipe(s) can be laid within the easement.

In cases where an existing interallotment drainage system is in place and the property being developed is proposing to connect into the system and is legally entitled to, calculations must be provided demonstrating that the existing system has sufficient capacity to cater for existing and any additional flows. Evidence must also be provided to show that the system is in a serviceable condition.

*Note: Full operational consent will not be granted until documentary evidence is submitted to Council confirming that the easement has been prepared by a Registered Surveyor and registered with NSW Land Registry Services. In other words, Council will require a deferred commencement condition.*

## 4.4 Discharging to Council's Drainage System Passing Through Private Property

Council will generally allow discharge from a site to a Council-owned drainage system that passes through the development site.

In situations where Council's drainage system passes through an adjacent property, the owner would need to acquire an easement to allow for the connection between the property boundary and the Council system or easement.

Where a Council-owned drainage system traverses private property and no easement exists, development of the site will require an easement to be created. To formalise the easement, a corridor will need to be documented on the Title Diagram of the property. It is to be located along the centreline of Council's stormwater pipe for the entire length of pipe within the property. The easement is to be in favour of Waverley Council and is to be registered on the Certificate of Title of the property. The creation of the easement and the registration of the easement to the Certificate of Title is to be undertaken by the applicant at no cost to Council. The width of the corridor shall be as per Table 5-7.

In cases where an easement is registered but is not in accordance with the required width identified in Table 5-7 or is not accurately located over the Council system, the existing easement will need to be extinguished, and a new compliant easement be created. This shall be undertaken by the applicant at no cost to Council.

***Please review Sections 5.10 and 5.11 prior to submitting a DA***

## 4.5 Discharging Through Council Owned Land

The uncontrolled discharge of urban stormwater into public parks and reserves can cause significant bushland degradation. The increased volume of water and velocities of water entering these areas compared to natural conditions promotes the formation of unnatural drainage lines, weed invasion and accelerated erosion and sedimentation. It is therefore preferable that properties falling to a public reserve or park drain to public drainage infrastructure in the reserve where possible.

Where a site falls away from the street and it adjoins a public reserve, construction of a drainage line through the reserve will generally not be permitted unless all other possible avenues have been exhausted including easements through private properties.

Council cannot grant private drainage easements over land classified as community land, which can include parks, creeks and reserves.

Where determined by Council's Engineer that drainage through Council owned land is the only option to facilitate disposal of stormwater runoff from properties that slope towards these areas and have no other means of drainage, Council will be required to extend the infrastructure to the site, at the cost of the property owner.

## 4.6 Outlets to Watercourses

Where discharging to a suitable natural waterway or creek is allowed by Council, the waterway is to be protected against erosion at the point of discharge with the provision of an outfall apron and energy dissipation structure. Stabilising a small length of the waterway in the vicinity of the outlet is not acceptable.

Council reserves the right to insist on connection to existing outlets only. New outlets will be considered on a merit basis and only a single discharge point will be considered.

**Guidance on the design of outlets to watercourses can be obtained from:**

a) NSW Office of Water guidelines for Outlets to Natural Watercourses.

b) Queensland Urban Drainage Manual

*Note: Any proposal to connect to a watercourse or creek must be discussed with Council before a Development Application is lodged.*

## 4.7 Infiltration

**Infiltration systems such as gravel filled trenches and sand filters may be used to retain and infiltrate stormwater on site. These systems are most effective in areas where the soil has a high infiltration rate. If the underlying soil is found to have very low infiltration capacity, the use of infiltration systems is discouraged:**

a) Infiltration may be proposed in areas:
   (i) where infiltration is permissible according to the Infiltration Map (Annexure B).
   (ii) outside those shown as permissible on the Infiltration Map. These will be assessed on their merits.

b) Infiltration systems are NOT permitted in areas with:
   (i) land slip or geotechnical problems associated with reactive soils;
   (ii) existing seepage problems;
   (iii) where contamination of ground water is possible;
   (iv) where the site is known or suspected of being contaminated;
   (v) exposed bedrock at surface;
   (vi) shallow soil over rock or shale;
   (vii) steep terrain (>10%); or
   (viii) high water table.

c) The storage volume of an infiltration system may be used to reduce the on-site detention storage volume.

d) Infiltration systems are to be designed in accordance with Australian Runoff Quality Guidelines (Institution of Engineers) and WMTM.

e) The infiltration rate of the soil is to be determined by a Geotechnical Engineer using an appropriate field or laboratory test. Assumed infiltration rates are not acceptable.

f) The proposed design must be accompanied by a geotechnical report from a suitably qualified and practising Geotechnical Engineer and results of a recognised Falling Head Test or Constant Head Test. The hydraulic conductivity must be tested at a minimum of four locations at the site of the proposed infiltration system, and at the base level of the proposed system. The geotechnical report is to also determine the depth to rock and the presence and depth of the water table.

g) The roof guttering and downpipe system should be designed to collect the 1% AEP rainfall event and pipe it to the infiltration system, or alternatively provide for surface collection of guttering overflows into the infiltration system.

h) A full hydraulic design is required to determine the necessary storage requirements for a range of storm events up to and including the 1% AEP rainfall event.

i) A factor of safety of 2 shall be applied to all infiltration rates for the infiltration calculations.

j) The minimum depth of soil required below the base of the infiltration system is to be 1m.

k) The device is to be kept clear of large trees, stormwater flow paths, vehicle pathways or heavy traffic pedestrian areas.

l) Sediment traps, vegetated filter strips or similar treatment systems are to be installed upstream to reduce sediment inputs and minimise likelihood of clogging.

m) Overflow discharges are to be directed to a swale, landscaping or a stormwater drain without affecting adjoining properties.

n) The infiltration system is not to be within one metre of any Sydney Water Sewer main. See Sydney Water's 'Technical guidelines, Building over and adjacent to pipe assets, October 2015.

o) A registered Structural Engineer shall determine the minimum distance to structural footings.

p) Distance to boundaries given the soil infiltration shall comply with Table 4-1.

### Quick checklist for an infiltration system

- ☐ *The infiltration rate of the soil is to be determined by a Geotechnical Engineer using an appropriate field or laboratory test. Assumed infiltration rates are not acceptable.*
- ☐ *The roof guttering and downpipe system should be designed to collect the 1% AEP rainfall event and pipe it to the infiltration system, or alternatively provide for surface collection of guttering overflows into the infiltration system.*
- ☐ *A full hydraulic design is required to determine the necessary storage requirements for a range of storm events up to and including the 1% AEP rainfall event.*
- ☐ *A factor of safety of 2 shall be applied to all infiltration rates for the infiltration calculations.*
- ☐ *A registered Structural Engineer shall determine the minimum distance to structural footings.*
- ☐ *Distance to boundaries given the soil infiltration shall comply with Table 4-1.*

Table 4-1: Distance to Boundaries given the Soil Type

| Soil Type | Infiltration Rate | Distance to Site Boundaries |
|---|---|---|
| **Sandstone** | Assumed to be negligible | Do not infiltrate on these soils |
| **Sand** | >180 mm/hr | 1 m |
| **Sandy Clay** | 36-180 mm/hr | 2 m |
| **Medium Clay** | 3.6-36 mm/hr | 4m |
| **Reactive Clay** | 0.36 –3.6 mm/hr | 5 m |
| **Seepage /dewatering** | All development applications. | 11.0 |

## 4.8 Charged Lines (Single Dwellings and Alterations and Additions Only)

**Where on-site stormwater detention (OSD) is not required and all reasonable efforts to establish a gravity drained system have been unsuccessful, charged (or pressure) lines may be permitted, subject to:**

a) Charged systems being designed, installed and maintained in accordance with the WMTM.

b) All gutters, downpipes and pipes in the system must be designed for a 1% AEP storm event.

c) Plans submitted shall show levels of Council's street gutter and the levels of the roof gutter being drained.

d) Downpipes are to be made watertight up to the connection with the gutter and painted, in a colour to compliment the development and to protect them against ultra-violet light damage from the sun.

e) All gutters must have an overflow point or pressure relief to ensure that flooding within the roof cavity or eaves of a building does not occur.

f) There must be a minimum difference in height between the roof gutter and the surface level of the discharge pit at the property boundary of 2.0 metres. Where a minimum 2.0 metres of hydraulic head is not provided, hydraulic grade line (HGL) calculations for the 1% AEP storm event are required to demonstrate there is sufficient head to drive the system.

g) There must be a gravity flow across the footpath from an isolating pit within the property – this pit must be sealed with a bolt down lid.

h) All services within the footpath must be located prior to submitting the plans and all details must be shown on the plans.

i) All pipes must be a minimum of 100 mm with all joints to be solvent welded.

j) A cleaning eye must be provided at the low point in the system within a pit that can be drained to an onsite dispersal system.

k) Gutter guards must be installed on all roof gutters to minimise debris entering the system.

l) Sealed cleaning eyes must be placed at 20-meter intervals, at critical bends in the pipeline and at the lowest point in the drainage system.

m) A dribble pit incorporating a pipe with a screw cap on the end and a hole in the cap, shall be provided at the lowest point in the charged system. The base of the pit shall have weep holes which drain into an aggregate bed underneath the pit. The location of the dribble pit is to be shown on the engineering plans.

n) No surface inlet pits or driveways can be connected to the charged line.

### Quick checklist for a charged system

- ☐ *All gutters, downpipes and pipes in the system must be designed for a 1% AEP storm event.*
- ☐ *There must be a minimum difference in height between the roof gutter and the surface level of the discharge pit at the property boundary of 2.0 metres. Where a minimum 2.0 metres of hydraulic head is not provided, hydraulic grade line (HGL) calculations for the 1% AEP storm event are required to demonstrate there is sufficient head to drive the system.*
- ☐ *There must be a gravity flow across the footpath from an isolating pit within the property – this pit must be sealed with a bolt down lid.*
- ☐ *No surface inlet pits or driveways can be connected to the charged line.*

## 4.9 Pump Out Systems

Pump systems are used where discharge from the site via gravity cannot be achieved.

A pump system will only be considered where the applicant can prove that all reasonable efforts have been made to implement a gravity drained system i.e., obtain an easement for downstream properties and/or that an alternative system has been investigated and deemed unsuitable.

For properties that fall to the street, the use of a pump-out system for stormwater disposal will only be permitted for drainage of basement driveways only.

Any pump out system proposed in a basement must only be used for the drainage of basement driveways.

**Where a pump system is proposed as part of a development, it shall comply with the following requirements:**

a) The pump system must be designed by a suitably qualified practitioner in accordance with the requirements of Section 8 of AS/NZS 3500.3 and this manual.

b) As a minimum, the pump system must consist of one duty and one standby pump.

c) The collection system for the pump system must be designed in accordance with the design criteria for gravity drainage and must incorporate adequate buffer storage as recommended by the pump manufacturer or a suitably qualified practitioner.

d) Consideration of the consequences of a power failure must be made when sizing the buffer storage.

e) The discharge rate from the site should not exceed the PSD. A full hydraulic design is required to determine the necessary storage requirements for a range of events up to and including the 1% AEP.

f) It may be acceptable for the duty and standby pumps to function at the same time for storms in excess of the 1% AEP event or in the event of a blockage.

g) The pump rising main must be installed in accordance with AS/NZS 3500 National Plumbing and Drainage Code, other relevant codes for pressure pipe systems and the manufacturer's specification.

h) Discharge from the system must pass through a stilling pit located within the site boundary prior to discharging to Council's below ground drainage system.

i) In some instances, connection to Council's kerb and gutter may be allowed, and a stilling pit will need to be provided within the site boundary prior to discharging to Council's kerb and gutter. If it is proposed to discharge to Council's kerb and gutter:

   (i) the pump must not operate continuously and;

   (ii) 3 hours must be allowed for the gutter to dry out between dry weather discharge events.

***A pump out system is a last resort option. Council will not be liable for all claims for damages arising if the pump out system fails.***

j) Discharge from the site to Council's below ground drainage system must be protected by a non-return valve or flap located within the property.

k) The pump must be located in an accessible and easily maintainable location.

l) In the event of the failure of both the duty and standby pumps, an overland flow path and/or surcharge and pondage in a suitably visible area must be provided.

m) In circumstances where no overland path exists, pondage may be approved in a suitable area. These areas must be sited with a view to minimising the cost of damage to occupiers of the property and include signage warning residents that inundation of the area may occur in the event of a pump failure.

n) An audible alarm should be set to activate when the water level in the storage area reaches a pre-determined level.

o) The pump units selected should be suitable for stormwater containing silt and grit as a minimum with appropriate screening for small and large solids.

p) Screening details must be provided. All electrical fittings and supply must be located to have at least 300 mm freeboard above the maximum water level and/or any overland flow paths.

q) Where a pump system includes a significant portion of above ground storage, a means by which the pump rating can be locked to prevent adjustment of the site discharge will be required.

r) The pump system and associated works must be installed, operated and maintained in accordance with development approval.

s) Council officers may inspect the pump system at any time.

*Note: Where a pump out system is proposed, the registered proprietor shall be required to submit written intent to establish and maintain a Planned Preventative Maintenance (PPM) schedule of the pump system prior to the issue of Occupation Certificate. The proponent shall indemnify Council from all claims for damages arising from the failure of the pump system. Evidence of the document shall be submitted to Council.*

### Quick checklist for a pump out system

- ☐ *The pump system must be designed by a suitably qualified practitioner in accordance with the requirements of Section 8 of AS/NZS 3500.3 and this manual.*
- ☐ *As a minimum, the pump system must consist of one duty and one standby pump.*
- ☐ *The collection system for the pump system must be designed in accordance with the design criteria for gravity drainage and must incorporate adequate buffer storage as recommended by the pump manufacturer or a suitably qualified practitioner.*
- ☐ *Consideration of the consequences of a power failure must be made when sizing the buffer storage.*
- ☐ *The discharge rate from the site should not exceed the PSD. A full hydraulic design is required to determine the necessary storage requirements for a range of events up to and including the (1% AEP).*
- ☐ *Discharge from the system must pass through a stilling pit located within the site boundary prior to discharging to Council's below ground drainage system.*
- ☐ *In the event of the failure of both the duty and standby pumps, an overland flow path and/or surcharge and pondage in a suitably visible area must be provided.*

# 5.0 Stormwater drainage design requirements

# 5.0

# Stormwater drainage design requirements

## 5.1 Design Rainfall Intensity

Intensity-frequency-duration rainfall data collected by the Bureau of Meteorology for Waverley Bowling Club is used for all hydrological calculations in the Waverley LGA (refer Annexure A). Where necessary, Council will request the utilisation of 2016 data. The data can be obtained from the BOM.

## 5.2 Design Storms

A stormwater drainage system is to be installed on each new development to comply with Table 5-1.

**Table 5-1: System Design Storm**

| Will water flow onto neighbouring property if the system surcharges? | The annual exceedance probability (AEP) storm event to adopt |
|---|---|
| If yes | 1% |
| If no | 5% |

## 5.3 Overland Flow Paths

a) Overland flow paths are to be designed to provide a fail-safe system of drainage for all development. Overland flow paths are designed to function when the stormwater system fails (due to blockage or capacity constraints).

b) Overland flow paths designed to contain a 1% AEP storm flow are to be provided for all stormwater systems.

c) Must comply with the velocity depth hazard requirements of the overland flow path (see Section 5.4.1 & 5.4.2).

d) Minimum freeboard requirements will apply (see Section 5.16).

e) Must be kept free of obstructions and must not be landscaped with loose material that could be removed during a storm event, such as wood chip or pine bark.

f) Overland flow paths must be provided in preference to the piping of major storm flows.

g) Where an overland flow path cannot be provided, Council will permit the piping of flows up to the 1% AEP storm event. In such a case a blockage factor of 50% must be applied to all inlet pits and a hydraulic grade line analysis shall be submitted to Council for approval. A freeboard of 100 mm shall be provided to the grate surface from the 1% AEP storm event predicted maximum water surface level within the pit.

## 5.4 Velocity Depth Hazard

During floods, the potential hazard to pedestrians can be expressed as the product of the velocity (m/s) times the depth (m), referred to as VxD product. A higher VxD product indicates an increased risk. To satisfy restrictions related to flood hazard, both the VxD product and limits to a maximum water depth should be observed. These limits must be strictly observed when designing overland flow paths on residential property developments.

### *5.4.1 Velocity x depth (VxD) as a measure of hazard*

a) The peak VxD product of stormwater runoff through areas accessible to children shall be kept below the limiting stability values provided in Table 5-2 below. Such areas include driveways, road gutters, car parking spaces, pathways and courtyards.

**Table 5-2: Velocity depth ratios**

| Depth of Flow (m) | Limiting Stability Value of Velocity x Depth for 100 year ARI storm event |
|---|---|
| 0.05 or less | 0.15 |
| 0.1 | 0.22 |
| 0.2 | 0.29 |
| 0.3 | 0.33 |
| 0.4 | 0.35 |
| 0.5 | 0.33 |
| 0.6 | 0.31 |
| 0.7 | 0.26 |
| 0.8 | 0.16 |

b) Suitable fences or other appropriate measures will need to be used to restrict access by children to areas where the peak V x D product exceeds the limiting stability value.

c) The V x D limit may be increased up to a maximum of 0.40 for pedestrian areas not easily accessible to children.

### *5.4.2 Water depth as a measure of hazard*

a) The degree of hazard resulting from relatively deep, slow moving or still water depends upon the grades of the land adjacent to the water's edge and progressing into deeper water.

b) Acceptable water depths are outlined in Table 5-3. Child-proof fences shall be erected to restrict access where these criteria cannot be satisfied.

**Table 5-3: Safe depth of flow for various approach grades**

| Approach Grade to Maximum Depth | Maximum Depth (m) |
|---|---|
| Greater than 1:5 | 0.3 |
| 1:5 to 1:15 | 0.8 |
| Less than 1:15 | No Maximum |

## 5.5 Roof Drainage Systems

For developments involving new buildings and extensions to existing buildings, roof drainage is to be designed according to the current editions of the National Construction Code and AS/NZS 3500.3. Generally, roof eaves gutters and downpipes are to be designed for rainfall intensities up to the 5% AEP event using the methods presented in the standard noted above (unless noted otherwise in this manual). If a development has box gutters or eaves gutters that may possibly overflow into the interior of a building, the design shall need to verify thatthe gutters will safely overflow without water entering the building for rainfall intensities up to the 1% AEP event. Design details and calculations of the roof drainage shall be included in the submitted stormwater management plan.

## 5.6 Internal Stormwater Drainage Pipes

Pipe sizes shall be sufficient to cater for the run-off capacity of the attached system. Stormwater pipes shall be designed in accordance with the requirements of AS/NZS 3500.3. The minimum diameter of any pipe used for stormwater drainage shall be 100 mm and comply with the following minimum longitudinal grades.

**Table 5-4: Internal Stormwater Drainage Pipe Design Requirements**

| Pipe Diameter | Minimum Gradient (%) |
|---|---|
| 100 | 1.00 |
| 150 | 1.00 |
| 225 | 0.50 |
| 300 | 0.50 |
| 375 | 0.50 |

## 5.7 Internal Stormwater Pits

a) Stormwater pits or cleaning eyes shall be provided at the following locations where appropriate to provide access and maintenance functions:
   (i) At all junctions, changes of gradient, changes of direction and changes in diameter;
   (ii) With a maximum spacing of 30 metres along a length of pipe;
   (iii) Reflux valves;
   (iv) Flap valves fitted at the downstream ends of subsoil drains; and
   (v) Directly above any reflux valves, orifice plates and debris screen.

b) Inlet pits are to be designed in accordance with AS/NZS 3500.3 and be installed in locations that:
   (i) Sheet stormwater flow between buildings or between buildings and boundary fences is minimised;
   (ii) All run-off from roofed and paved areas is collected;
   (iii) Run-off does not enter buildings or garages;
   (iv) Long term ponding of stormwater does not occur;
   (v) Pedestrian access is not affected by depths of flow; and
   (vi) Flows over the public footway are minimised.

c) The minimum pit size shall be as specified in Table 5-5 below.

**Table 5-5: Internal Stormwater Pit Design Requirements**

| Depth of pit (mm) | Minimum Pit Size (mm) |
|---|---|
| D ≤ 450 | 350 x 350 |
| D ≤ 600 | 450 x 450 |
| 600 < D ≤ 900 | 600 x 600 |
| 900 < D ≤ 1200 | 900 x 900 |
| 1200 < D | 900 x 900 (with step irons) |

d) All pipes should be cut flush with the wall of the pit.

e) The grated covers of pits larger than 600 x 600 mm are to be hinged to prevent the grate from falling into the pit.

f) The base of the drainage pits should be at the same level as the invert of the outlet pipe.

g) All pits must be benched.

h) Paved areas and driveways falling towards Council's footpath must be provided with a full driveway width grated box drain at the property boundary (to be wholly located within private property), draining into the internal system and of minimal internal dimension of 200 mm wide x 100 mm deep. The bars of the grating are to be parallel to the direction of surface flow.

i) Pits with depths between 1.2 metres and 6 metres are to have step irons in accordance with *AS1657:2018 Fixed platforms, walkways, stairways and ladders – Design, construction and installation*. For pits greater than 6 metres other means of access must be provided.

j) PVC pits will only be permitted if they are not greater size than 450 x 450 mm (maximum depth 450 mm) and are heavy duty.

k) In-situ pits are to be constructed on a concrete bed of at least 150 mm thickness. Pits deeper than 1.8 m are to be reinforced concrete. The walls are to be designed to meet the minimum requirements Clause 7.5.5 of AS/NZS 3500.3.

l) Grates are to be galvanised steel grid type. Grates are to be of heavy-duty type in areas where they may be subject to vehicle loading.

## 5.8 Inground Drainage Public Infrastructure Network

### *5.8.1 General*

a) The maximum number of stormwater connections direct to the below ground stormwater system is 1 per site.

b) All connections to Council's below ground drainage system shall occur at a stormwater pit for pipe diameters greater than 100 mm. If no such pit exists adjacent to the site, then a new grated kerb inlet/access pit will need to be installed over the existing Council pipeline at the applicant's expense.

c) When connecting into an existing or proposed kerb inlet/access pit, the invert level of the connecting pipe shall be at or above the top third of the Council pipeline.

d) When pipes are connected into existing or proposed pits, the pipes shall be cut flush with the internal wall of the pit and the pipe should enter the pit perpendicular to the pit wall. All damages to the internal wall of the pit around the pipe connection must be fully repaired to Council's satisfaction.

### *5.8.2 Pipes*

a) The minimum pipe size must be 375 mm diameter.

b) The minimum pipe grade shall be 1%.

c) The minimum pipe class shall be Class 3.

d) Fibre reinforced concrete (FRC) or other materials will not be accepted unless deemed practical by Council.

e) The minimum pipe cover shall be in accordance with the pipe class, materials, the manufacturer's recommendations and applicable standards.

f) The minimum pipe velocity should be 0.6 m/s and a maximum velocity of 6.0 m/s during the design storm in order to be self cleansing and prevent silt accumulation.

g) Pipes must not be encased by mass concrete.

### *5.8.3 Pits*

a) Kerb inlet pit shall be 2.4 metres in overall length (with 1.8 metres clear internal opening).

c) Standard Council grated kerb inlet pits are required:

  (i) Every 30 m along the extended system.

  (ii) At every change in direction along the extended system, where it can also collect water.

  (iii) Prior to each road intersection.

c) Standard Council junction pits must be 900 mm square.

d) Standard Council junction pits are required:

  (iv) At every change in direction along the extended system, where a grated kerb inlet pit is not required.

  (v) Where a drop pit is required and a grated kerb inlet pit is not required.

e) All new stormwater pits must be benched with the pipes cut flush with the wall of the pit. Pits shall have a minimum thickness of 150 mm and minimum of SL82 mesh reinforcement.

f) Pits greater than 1.2 metres in depth shall have step irons.

g) The class of all access covers and grates shall be chosen as per the requirements of AS3996 (minimum Class D).

## 5.9 Vehicular Crossings Impacting Existing Council Drainage Pits

**Where it is proposed to modify an existing vehicle crossing or construct a new vehicle crossing and this work requires the alteration or relocation of an existing Council drainage pit, then:**

a) The existing inlet capacity to Council's below ground drainage system is to be maintained, if not improved.

b) A standard Council grated pit with a 2.4 m overall length extended kerb inlet (or a longer kerb inlet if it is needed so as to maintain inlet capacity), is to be constructed upstream of the proposed vehicle crossing. Proposing kerb inlet pits in front of neighbouring properties will not be supported without the concurrence of the neighbouring property owner.

c) Existing on grade kerb inlet pits affected by the crossing shall be converted into a junction pit. Council will not allow any kerb inlet pits to be converted into butterfly or V- grated pits.

d) The newly constructed kerb inlet pit will either:

  (i) be constructed over the existing below ground drainage system if one is present; or

  (ii) will require the extension of the existing below ground drainage system;

e) All costs associated with providing the vehicle crossing and altering the stormwater system are to be paid for by the applicant.

f) The distance between the edge of the lintel of any stormwater kerb inlet pit and the wing of any proposed vehicular crossing shall be at least 500 mm.

## 5.10 Designing for Easements

Easements shall be free of any building encroachments, including eave overhangs and footings. Full details of any proposed piped system within an easement are to be submitted for Council approval at DA stage. No work is to be carried out in the easement until it has been registered with NSW Land Registry Services and the downstream property owner's permission and a relevant construction certificate has been obtained. All works in relation to easements are to be at no cost to Council.

Table 5-6 outlines the following standard easement widths that shall be adopted for private systems.

**Table 5-6: Required Drainage Easement Widths for Inter-Allotment Drainage**

| Pipe Diameter (mm) | Width of Easement to Drain Water (m) |
|---|---|
| 150, 225 | 1 |
| 300 | 1.5 |
| 375, 450 | 2 |
| Flowpath/floodway | Full width of the nominated flowpath/ floodway plus 0.2m |

Table 5-7 outlines the following standard easement widths that shall be adopted for Council owned stormwater assets.

**Table 5-7: Required Drainage Easement Widths for Council Owned Stormwater Infrastructure**

| Pipe Diameter (mm) | Width of Easement to Drain Water (m) |
|---|---|
| 375, 450, 525, 600, 675, 750, 825, 900 | 3 |
| 1050, 1200 | 3.5 |
| 1350, 1500 | 4 |
| 1650, 1800 | 4.5 |
| >1800 and box culverts | As required by Council |

The above tables are only an indication of easement widths for shallow pipe systems. Larger easements may be required for pipe with excessive cover or where multiple pipes are proposed.

Consideration may be given to the minor reduction of the required easement widths (for sections where the full width of the easement cannot be achieved) where it is demonstrated that the full easement width cannot be obtained and the proposed pipe can reasonably and economically be installed, maintained and replaced satisfactorily.

## 5.11 Building Over and Adjacent to Council Drainage Easements

Council will not approve the construction of any fixed structure over an existing below ground drainage system or within the confines of an easement (inclusive of swimming pools, garages, retaining walls, balconies, eaves, roof overhangs and gutters). Council may, at its discretion, permit hard paving and/or landscaping to be constructed over an easement or an existing below ground drainage system.

The landscaping shall be restricted to ground covers and shrubs and shall not include trees. Any landscaping shall allow access to the below ground drainage infrastructure for future maintenance.

Buildings adjacent to easements shall be designed with footings located entirely outside of the easement and in accordance with the following requirements. These requirements are also applicable to structures adjacent to Council pipelines not covered by easements.

Where a structure is within the zone of influence of the drainage infrastructure or easement then the structure shall be self supporting to allow for excavation of Council's pipe or land within the easement without the need to support any adjacent structures.

***At its discretion, Council will only allow paving and/or landscaping over an easement or an existing below ground drainage system. This is so that a pipe can be reasonable and economically installed, maintained and replaced satisfactorily.***

**The zone of influence is to be defined as:**

a) Where Physical Infrastructure exists – the area 300 mm below the underside of the infrastructure, extended to the easement boundaries and battered to the natural surface level, at the angle of repose, for the saturated in-situ soil. As a maximum the angle of repose shall be no steeper than 45 degrees.

b) Where No Physical Infrastructure exists – the same definition for where physical infrastructure exists except that the underside of the infrastructure is to be assumed to be 1.5m below the existing natural surface level.

**Note that other requirements including but not limited to the following are enforced by Council. These requirements would typically need to be met prior to the development consent:**

a) A peg-out survey of the Council Stormwater pipe to determine its location for its full extent within the property (or as otherwise specified) will need to be undertaken. The pipe will need to be physically located by careful excavation or by a professional service locating contractor at the property boundaries and at changes of direction or junctions of the system. The alignment of the pipe, level of the pipe and confirmation of its size will need to be identified and surveyed and a copy of this peg-out survey forwarded to Council. The peg-out is to show the width of the pipe (to scale). This peg-out will need to be plotted onto architectural and stormwater plans. It is likely that the applicant may need to engage a professional service-locating contractor in liaison with their surveyor to meet this requirement.

b) Pre-development dilapidation report is required and will include CCTV footage of the full extent of the Council stormwater pipe within the property (or as otherwise specified). The footage is to include the inspection and notation of all visible defects and joints along the pipe. A specialised plumber / contractor who has a suitable CCTV tractor that can access the pipe and provide suitable quality footage of the pipe will need to be engaged.

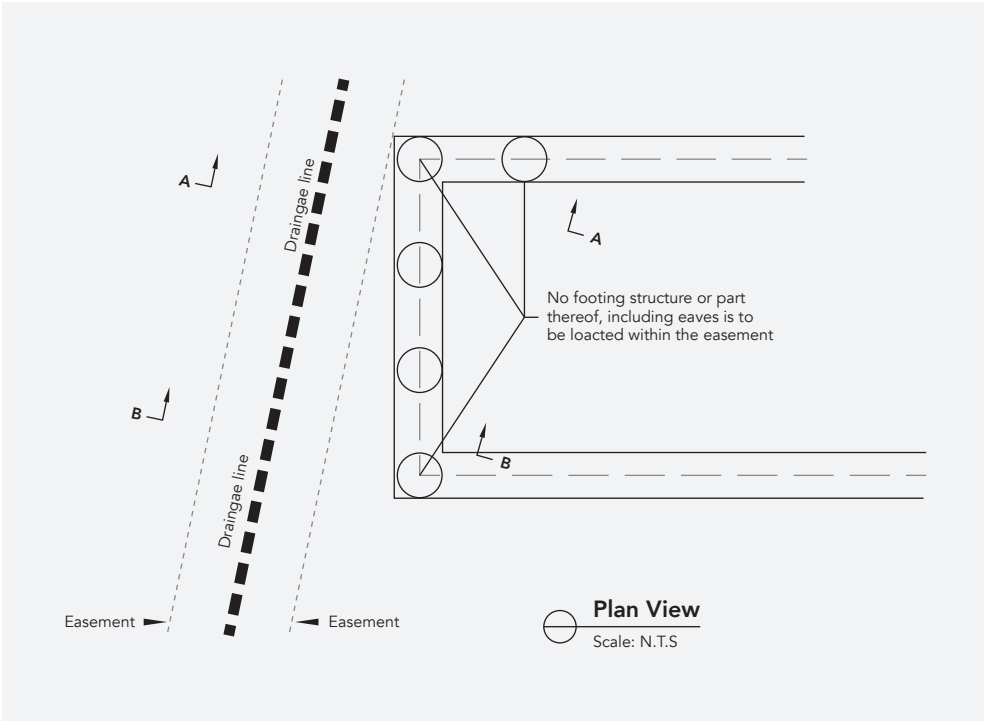
c) If deemed necessary by Council, a structural report will be required that certifies that the development will not impact upon Council's system or easement and the development will be structurally independent of the easement, i.e., that all structures within the development could be removed without impacting on the easement and vice versa. The report may also need to include machinery and stockpiling exclusion areas and work procedures statements and plans that allow for the protection of Council's system.

d) Evidence of the builder / principal contractor having current Product and Public Liability insurance to a minimum of 10 million dollars.

e) A security bond to be lodged with Council for any damage caused to Council's stormwater system. This bond would be typically required prior to the issue of the Construction Certificate and held for the duration of all works on site. The bond amount is listed in Council's Pricing Policy and Schedule of Fees and Charges.

f) A post-development dilapidation report to the same specifications as the pre-development report will be required upon completion of all building works. This report would be reviewed and compared to the pre-development report, with any defects or damage that has occurred between the reports deemed to have been caused by the development works.

Figure 5-1: Plan location of footing and piers adjacent to a drainage easement




***Where any structure is over an existing Council drainage easement or stormwater pipeline, and Council needs to gain access, the property owner shall bear all costs associated with the removal.***

Figure 5-2: Zone of influence directly adjacent to a drainage easement

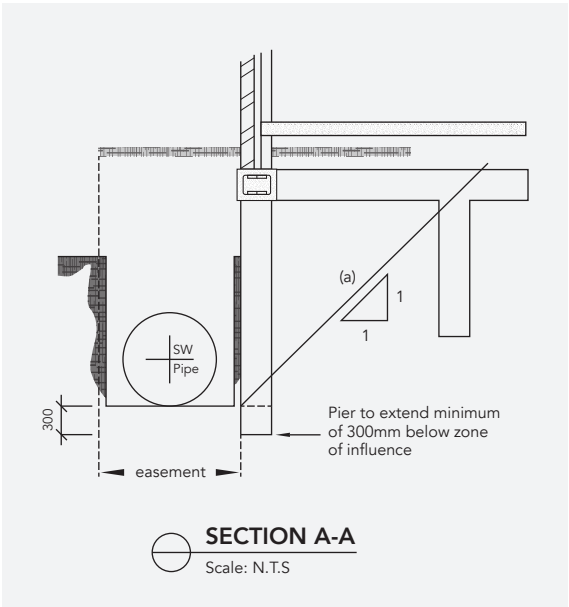
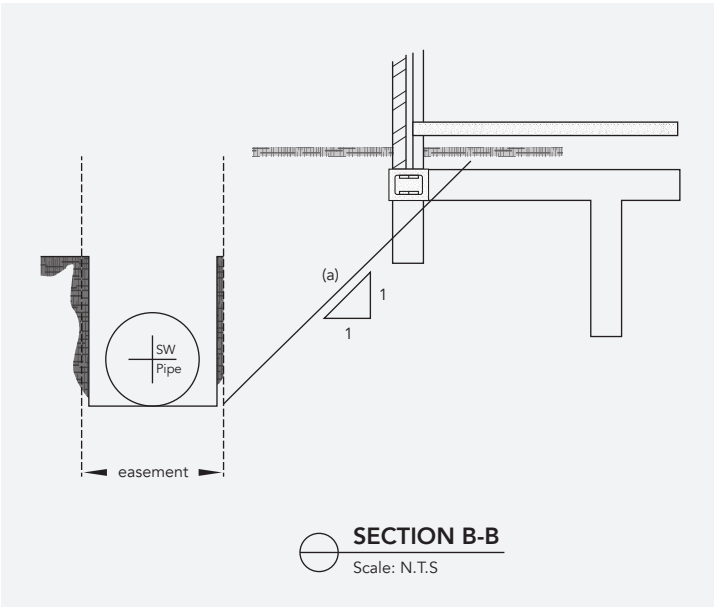



Figure 5-3: Zone of influence adjacent to a drainage easement



## 5.12 Modifications to Council's Drainage System

Where a development proposes to modify Council's drainage system (inclusive of its extension or realignment), the proposal will be assessed on merit. The applicant will be responsible for providing sufficient information to demonstrate to Council's satisfaction that the proposal is feasible, can be built to current standards and specifications, will allow for suitable and safe access for inspection and maintenance, and will meet the requirements as specified below.

**Documentation is to be prepared for Council's review and approval prior to development consent. The documentation must include:**

a) A detailed survey that includes all features including but not limited to property boundaries, kerb and gutter, road pavement, driveways, footpaths, buildings, walls, stairs and other structures, trees, finished ground surface types, the surrounding drainage system, service covers, pits and poles. The alignments and levels of all underground services in the vicinity of the Council stormwater pipe deviation works are also to be plotted on to the survey.

b) A peg-out survey of the Council Stormwater pipe of an extent as specified by Council will need to be undertaken. The pipe will need to be physically located by careful excavation or by a professional service locating contractor. The alignment of the pipe, level of the pipe and confirmation of its size will need to be identified and surveyed and a copy of this peg-out survey forwarded to Council. The pegout is to show the width of the pipe (to scale). It is likely that the applicant may need to engage a professional service-locating contractor in liaison with their surveyor to meet this requirement.

c) A full scaled long section of the proposed stormwater pipe, indicating the existing surface levels, available cover, design levels of the pipe, surface and invert levels of all pits, location of all stormwater pits and the location and level of all service lines that are in the vicinity of the works. This long section will need to show that the pipe can be installed with adequate vertical and horizontal clearances from all existing underground service lines. These clearances are to be as specified by the relevant service providers.

d) The design alignment of the proposed works and details of proposed pipe material, size and class.

e) Locations of all stormwater pits and pit types proposed.

f) Calculations demonstrating that the proposed system has capacity greater than the existing system that is being replaced;

g) Calculations demonstrating that the proposed system meets the required design capacity as specified by Council. Council will typically require that the system's capacity meets or exceeds the 5% AEP event. At times, Council (at is discretion) will require the system's capacity to be increased above the 5% AEP storm event.

h) Will not increase or concentrate flooding on any private property (including the site being developed) or the road reserve. The supporting evidence is to include details and modelling of any surcharge that will occur at the downstream end of the proposed drainage system in cases where the new system has greater capacity than the existing downstream pipes.

**Council may also request additional information not limited to the following:**

i) Dilapidation (CCTV) reports of the existing stormwater system.

j) Extended detailed surveys of the catchment or downstream areas.

k) Structural reports with respect to any impacts of the proposal on existing or proposed footings.

All costs associated with this exercise must be borne by the applicant.

## 5.13 Hydraulic Grade Line Analysis

Where required, hydraulic grade line calculations shall be carried out in accordance with Australian Rainfall & Runoff (AR&R) procedures. Calculations shall include losses due to friction, obstructions, bends, junctions and pressure changes; design flow and tail water influences on the system.

**Pipe losses can be estimated using the Darcy Weisbach equation with friction and K factors based on manufacturer design guides from:**

a) Vinidex (PVC)

b) Iplex (PVC)

c) Humes (RCP)

d) Rocla (RCP)

Pit losses can be estimated using factors obtained from Missouri or Hare charts.

## 5.14 Tailwater

Where the effect of any downstream controls is to be considered, the following levels are to be used as a starting point for back calculations

**Table 5-8: Drainage system design requirements**

| Condition | Level |
|---|---|
| Free outfall | Pipe Obvert |
| Discharge to kerb & gutter or existing pipe | Top of kerb or relevant flood level (whichever is higher) |
| Discharging to receiving waters | Flood level of creek during the design AEP storm event |

## 5.15 Subsoil Drainage

**Sub-soil drainage systems are to be designed and constructed as per Section 6 of AS/NZS 3500.3. Subsoil drains shall be connected to the site drainage system and disposed of in a manner that will not have any adverse impact on adjacent properties. The following controls apply to subsoil drainage systems:**

a) Subsoil drains must discharge to a surface boundary pit prior to the discharge point so as to minimise the distribution or accrual of sediment in the receiving drainage system.

b) In instances where subsoil drainage will affect the groundwater table, the level of drawdown must be contained within the site and not to influence neighbouring propertie.

c) The subsoil drainage system must be designed to prevent constant discharge of groundwater to the receiving drainage system to avoid nuisance surface seepage.

## 5.16 Flooding, Floor Level Control and Freeboard Levels

a) Habitable floor levels must be set at a minimum of 300 mm above the predicted design flood level.

*Note: At the time of preparing this manual, Council endorsed the Waverley LGA Flood Study 2021. The Flood Study identifies all properties identified as flood affected. All properties identified as flood affected have had their 10.7 Planning Certificates updated. Waverley Council shall be contacted for further information.*

*To find out if your property is affected, please visit the Council's website.*

b) For all other areas, the habitable floor levels must be set at a minimum of 150 mm above the level of adjacent ground.

# 6.0 On-site stormwater detention (OSD)

# 6.0

# On-site stormwater detention (OSD)

**OSD systems prevent any increase in downstream peak flows resulting from new developments or redevelopments by temporarily storing on site the additional and quicker runoff generated. The discharge is restricted to a rate that can be accommodated by Council's existing stormwater drainage system.**
**Its benefits include:**

a) Reduced property flood damage;
b) Reduced personal safety risks due to flooding;
c) Reduced infrastructure damage; and
d) Reduced conveyance infrastructure requirements (downstream).

## 6.1 Exemptions

**OSD is applicable to all types of developments excluding the following:**

a) The proposal is a one-off alterations and additions to an existing building where the additional increase in impervious area is less than 30 $m^2$;
b) A lot where the site's stormwater discharges directly to a bay or waterway;
c) A change of use without any modifications to the building footprint and impervious areas;
d) A new detached, semi-attached or attached dwelling or dual occupancy on land subject to significant inundation (approximately over 50% inundation of the site due to a 1% AEP storm event). Please refer to Section 7.1 of this manual for further information;
e) The proposal involves upgrading the downstream public drainage network to cater for the storm flows up to and including the 1% AEP storm event being directed to it.

## 6.2 General Requirements

a) The system is to be protected by a Restriction on Use of Land and Positive Covenant requiring the owners to carry out periodical maintenance. An example OSD system Positive Covenant and Restriction on Use of Land template is included as Annexure E.
b) OSD system must generally, be located as close as possible to the lowest point of the site and be designed to collect all piped and surface stormwater runoff from all pervious and impervious areas of the site. The location and design of the OSD system must not have a detrimental impact on upstream or adjacent properties.
c) Any stormwater overflow from the gutters of proposed buildings shall be collected by inlet pits on the ground and/or drained via overland flows paths into the OSD system. Where this is not possible, the gutter and stormwater system shall be designed to convey the 1% AEP storm event to the OSD system.
d) Flows generated from adjacent properties that run onto the property must bypass the OSD system. This is to prevent flows, external to the site, entering the OSD system, filling it more frequently resulting in increased surcharging and nuisance to residents.
e) OSD systems must not be situated within deep soil zones.
f) OSD systems must be located above the 1% AEP floodplain and not be located in drainage easements and/or overland flow paths that convey flows from external catchments.
g) The OSD system must not be established across property boundaries. All walls forming the detention basin shall be constructed wholly within the property boundaries of the development site. A notation shall be shown on the drawings indicating such.
h) The catchment area used when determining the permissible site discharge (PSD) and OSD storage volume requirement shall include the entire site area not just the additional impervious area.
i) All OSD systems for multi-unit and commercial developments must be located in common areas (not in private courtyards etc).
j) The facility shall be designed to safely convey all possible overflows to an adequate Council street gutter or below ground stormwater drainage system.
k) A spillway or overflow outlet is to be provided in all OSD systems as part of the operation of the system to cater for system failure or extreme storm events. Additionally, a formal surcharge path must be provided for overflow from the system. This is to ensure that overflows are conveyed to the downstream drainage system and away from other property. Suitable armour is to be fixed over the overflow to protect the spillway.
l) OSD is not to be designed as a High Early Discharge (HED) system unless specifically requested by Council.

m) Generally, the minimum orifice size permissible is 40 mmø to minimise blockages. Where the calculated orifice is less than 40 mmø the detention system should be redesigned as necessary. The absolute minimum orifice diameter is 25 mmø in accordance with AS/NZS 3500.3. However, orifices this small will only be accepted at Council's discretion where it is deemed that an alternative design is not possible or practical.

n) Ponding and overflow levels shall be not less than 300 mm below any adjacent habitable floor levels of buildings and not less than 150 mm below non-habitable floor levels.

o) Developers and designers are encouraged to use principles of good aesthetics when preparing an OSD design. Long term viability, ease of maintenance and access to the drainage system and storage areas should also be considered in the design process. It is recommended that the OSD designer consults with the architect, landscape designer and arborist prior to completing an OSD design. This will ensure that all drawings correspond in terms of location of buildings, walls, existing trees being retained and landscaping treatments proposed on the site.

p) A sump (with a base level set below that of the main storage) shall be provided at the outlet point. It is set below the level of the main storage to collect debris. Where a discharge point pit is included in the storage, this shall contain a sump set at a minimum of 1.5 times the diameter of the orifice of the outlet below the centreline of the orifice or 200 mm, whichever is more. Sumps shall be provided with weepholes to drain out to the surrounding soil and shall be founded on a compacted granular base.

q) All surface inlet drains upstream of the system must be designed so that there is no overflow from these before the storage is full.

r) A maintenance schedule is to be prepared in accordance with Section 6.8.

s) Annuxure M presents example drawings of OSD systems.

## 6.3 Permissible Site Discharge

The permissible site discharge (PSD) is limited to the maximum discharge from the site during the 20% AEP for a 5 minute storm event under the undeveloped site conditions.

### *6.3.1 Discharge control using an orifice plate*

**The PSD can be regulated using an orifice plate. The cross sectional area of the orifice control is to be calculated as follows:**

$$A_o = Q/C_d \sqrt{2gh}\ (m^2)$$

$A_o$ = Cross Sectional Area of orifice ($m^2$)

$Q$ = Permissible Site Discharge ($m^3/s$)

$C_d$ = Discharge Co-efficient = 0.6

$g$ = Acceleration due to Gravity = 9.8 $m/s^2$

$h$ = Head of Water (m) above the orifice, i.e. the vertical distance from the centre of the orifice to the maximum water storage level.

This equation relies on a circular sharp-edged orifice and free discharge from the orifice.

## 6.4 Storage Volume

(a) Detention systems may provide stormwater storage in the following ways:

(i) above ground in a grassed or landscaped area where it can be provided with minimal adjustment to ground levels and existing vegetation or in a shallow pond in a driveway or carpark;

(ii) below ground in a cast in-situ concrete tank(s); or

(iii) as a combination of the above.

(b) The OSD storage volume requirement must allow for the detention of stormwater runoff resulting from a storm with an AEP of 1%.

***In other words, the summation of the discharge rate from the OSD system and rate of runoff from the bypass areas during a 1% AEP storm event shall not exceed the PSD.***

### *6.4.1 Above ground storage*

a) Top of wall levels of above ground detention systems should generally be set a minimum of 100 mm above the top of water level, excluding the spillway.

b) Any retaining walls surrounding the above-ground storage, including a spillway, shall be in watertight concrete or masonry construction (timber construction is not permitted) and structurally adequate to accommodate the hydrostatic loading from full storage.

c) Any buildings forming the walls of the above-ground storage shall be adequately waterproofed to prevent water entering the sub-floor area.

d) Vertical sides near driveways or pedestrian areas are to be protected with an appropriate treatments such as fencing, kerb, edging or landscaping, to minimise hazard to pedestrians and vehicles.

e) Suitable access shall be provided for maintenance purposes, which may include ramps or accessible gradients.

f) Graded at a minimum of 1% to drain completely. Long term ponding of water over the floor of the basin will not be acceptable.

g) Contain an overflow outlet with overflows directed away from private property.

h) Contain an inspection/access grate 600 x 600 mm directly over the outlet.

i) Maximum ponding depth to be less than 150 mm (desirable) and 200 mm (maximum) in areas where vehicles will be parked and less than 200 mm (desirable) and 300 mm (maximum) in landscaped/common areas.

j) Steps must be provided where the step down to storage invert exceeds 200 mm.

k) Not restrict pedestrian access from the public road to buildings.

l) Above ground storage facilities on surfaces other than paved driveways, when permitted by Council, should possess the following characteristics:

(i) The storage volume is to be increased by 20% to allow for the growth of vegetation and minor variations to the ground level that will occur as part of the general maintenance.

(ii) The design must be undertaken in consultation with the landscape designer to ensure that the engineering and landscaping plans are not in conflict.

(iii) Careful consideration shall be given to types of planting and landscaping treatment within the area of ponding, to ensure that the area can be readily maintained and the storage volume is not reduced over time.

(iv) Landscaping shall be designed to not generate large amounts of debris or other material likely to cause stormwater pollution or blockage of the system. Treatments such as wood chips / mulch or bare soil and the like shall not be permitted within the area of inundation.

(v) If an earth mound is used to retain the water, the minimum crest width is to be 1.0 metres wide.

(vi) If a structure other than earth mounds is to be used to retain water, it shall be certified by a suitably qualified practitioner to be structurally adequate to retain the design volume of water.

(vii) Designed in a manner which minimises inconvenience caused by the basin.

(viii) Not be unsightly or hazardous.

(ix) Totally impermeable apart from infiltration into the ground.

(x) Subsoil drainage shall be installed in landscaped storage areas to prevent the area remaining saturated during wet weather.

m) Be designed in a manner minimising inconvenience caused by the basin.

n) Above-ground tanks (for example, modified rainwater tanks and combined rainwater and OSD tanks) may only be used for OSD storage for runoff from the roof of a new single dwelling, new secondary dwelling, or an alterations and additions to the aforementioned development type. The design of above-ground tanks must consider appearance and urban design issues. Particular attention must be given to access for inspection and maintenance. Note the following design requirements applicable to above ground OSD tank storage:

   (iv) When OSD is proposed in an above ground tank, all gutters, downpipes and pipes connecting to the system must be designed for the 1% AEP event;

   (v) The design is to include an inspection point that allows for the cleaning and inspection of the orifice;

   (vi) Debris and leaf screens are to be installed on all downpipes and/or all inlets. These screens shall be easily accessible to facilitate maintenance works;

   (vii) At its discretion, Council may request above-ground tanks to comply with the same engineering criteria as below-ground tanks.

### *6.4.2 Below ground storage*

*This section is also applicable to systems proposed under a deck, alfresco, patio, concrete slab or the like.*

a) Be structurally designed to adequately withstand all service loads and provide adequate service life (50 years). The storage is to be certified that it is structurally adequate for all maximum estimated loadings including earth, traffic and hydrostatic loads generated by a full storage.

b) The tank is relative-self cleansing i.e. the base has a minimum of 1% fall to the outlet and is appropriately shaped. All water is to be drained from the tank by gravity.

c) Adequate access is provided so that the tank can be readily inspected from the surface for silt and debris. Under these requirements, a minimum of two 600 x 600 mm access grates would be required at a maximum of 3 m spacing. The above grates needs to have a double opening to access the tank conveniently to facilitate cleaning of the tank. An access grate must be provided directly over the orifice. The tank must well ventilated and will not cause any accumulation of noxious odours.

d) Where the tank is less than 600 mm in clearance height, gratings over the tank must be installed which cover at least 30% of the surface area of the structure.

e) When the depth exceeds 900 mm, grates must be 900 x 900 mm.

f) Residents/owners must be able to inspect critical parts of the storage from the surface without having to remove heavy access covers. Concrete covers shall be avoided for this reason. Council may allow sealed covers in locations where it is not feasible to install grates.

g) If a sealed OSD storage is approved, the build-up of noxious odours in storages without a grated access can create problems. If the storage is sealed, vents are to be provided and/or a hydrostatic valve must be provided.

h) The orifice is to be screened using a stainless steel or galvanised mesh screen (maxi-mesh RH3030 or equivalent), fitted with a lifting handle shall be provided.

i) Contain step irons where the tank depth is in excess of 0.9 metres.

j) Be located outside the root zone of trees that must be retained.

k) Have a child proof locking system for the surface grate where tank's depth is greater than 1.2 metres.

l) Vertical walls shall be finished smooth so that they cannot collect litter and debris. Walls will generally satisfy this requirement if they are block walls with flush joints or concrete walls with smooth surface.

m) Have a minimum soil cover for 300 mm in landscaped areas.

n) Underground systems shall comply with AS 2865 Safe Working in a Confined Space.

o) In accordance with Work Health and Safety requirements, only persons with Confined Space Training shall be permitted to enter below-ground storage tanks for any required maintenance. Council requires that a Confined Space Danger sign be placed at all access points to the below-ground storage tanks.

p) When an OSD system is proposed underneath a garage slab, where possible, the orifice and access grate shall be located outside the extent of the garage to provide adequate ventilation.

## 6.5 Calculation Methods

OSD calculations shall be undertaken in accordance with The Mass Curve Method described in *Australian Rainfall and Runoff* (Institution of Engineers, 1987) or using models such as DRAINS. When a DRAINS model is utilised, the DRAINS data and result shall be presented in a professional format, and the model shall be submitted to Council for assessment. Council may request any modelling to be undertaken in accordance with ARR 2019. Shall any modelling submitted is required to be updated, it must be undertaken at no cost to Council.

## 6.6 Drowned/Submerged Orifice

OSD systems shall be designed to allow for the system to be free draining with the invert of the orifice 100 mm above the Hydraulic Grade Line (HGL) at the discharge point.

**The HGL will be determined as:**

a) Top of kerb when connecting into the kerb and gutter or road drainage system; or

b) The 1% AEP flood level at the discharge point as determined by a Council flood study.

## 6.7 External Flows

Provision shall be made to ensure that external flows entering the development site do not cause the OSD system to unintentionally surcharge. Any flows generated from the local upstream catchment are not to be obstructed but rather permitted to drain into the development site. These flows shall be quantified and captured with a separate drainage system, intercepting swale or directed into an overland flow path and subsequently directed to the point of discharge separate to the OSD system.

## 6.8 Maintenance Schedule

A Maintenance Schedule for the proposed OSD measure must be prepared and submitted with the Construction Certificate Plans. The Maintenance Schedule shall include details of all OSD components that must be maintained, an outline of the required maintenance works, how and when these will be performed, and who will be carrying out these maintenance works.

## 6.9 Signage

Signage shall be provided to the OSD system in accordance with Annexure L of this manual.

# 7.0 Roofwater harvesting

# 7.0

# Roofwater harvesting

Notwithstanding BASIX water conservation targets, the collection of rainwater for non-potable use is encouraged. Roofwater harvesting systems keep the rainwater on site (retained) to be reused again for such things as irrigation, toilet flushing etc.

**Maximising the use of rainwater reduces the water level inside the tank in order to capture the greatest amount of water possible at the time of a rainfall event and reduces overflow from the rainwater tank to the stormwater system. Harvested roofwater shall be used for:**

a) Toilet flushing water;

b) Laundry washing water;

c) Outdoor water uses such as garden watering and car washing;

d) Topping up and/or filling up pools and spas; or

e) As specified by BASIX.

## 7.1 Minimum Requirements

a) BASIX Certificate Requirements - Rainwater re-use shall be provided in accordance with BASIX Certificate requirements.

b) Rainwater Re-use - Part of BASIX requires the installation of rainwater re-use facilities. The volume of storage required depends on the size of the dwelling, the number of amenities and other site factors.

c) New detached, semi-attached and attached dwellings on land subject to significant inundation during a 1% AEP flood event (as per Section 6.1) shall install a rainwater reuse system with a volume of 10,000 Litres in lieu of OSD.

d) New dual occupancies on land subject to significant inundation during a 1% AEP flood event (as per Section 6.1) shall install a rainwater reuse system with a volume of 5,000 Litres (per unit) in lieu of OSD.

e) The minimum re-use volume to be provided shall be the greater of the volume determined from the BASIX Certificate and Council's minimum Rainwater Re-use volume. Additional storage is also encouraged but is subject to Council's planning requirements

## 7.2 Installation Requirements

**Any rainwater tank that is to be installed in the Waverley LGA must comply with the following installation requirements:**

a) Must not collect water from a source other than roofs on a building or a water supply service pipe;

b) All rainwater tanks must be installed in accordance with the manufacturer's recommendations;

c) Rainwater tank installation must be undertaken in accordance with relevant australian standards, cords and industry guidelines (e.g. *AS3500:2003 national plumbing and drainage, hb 230-2006 rainwater tank design and installation handbook*);

d) The system must be designed to collect roof water only. Roofwater shall not be sourced from roofs coated with lead or bitumen-based paints, or from asbestos-cement roofs;

e) Be fitted with a first flush device, being a device that causes initial runoff to bypass the tank to prevent potential contaminants from entering the tank;

f) If supply is supplemented with a top up system by interconnection with a reticulated water system, backflow prevention must be provided in accordance with the relevant Australian Standards;

g) The tank must be enclosed and inlets screened, so as to prevent the entry of foreign matter and to prevent mosquito breeding;

h) Tank overflow must be connected to a detention/ infiltration device, stormwater drain such that it does not cause nuisance to neighboring properties;

i) All fixtures connected to the supply system are marked 'rainwater';

j) A sign must be affixed to tanks clearly stating that the water in the tanks is not for human consumption above ground tanks must be located wholly within the building setbacks;

k) Above ground tanks shall not require excavation of more than 1 metre from natural ground level to be installed;

l) Below ground tanks may be located outside the building setback provided they are not visible from the street and do not rise above the surrounding ground. The tank must not be installed within the zone of influence of any foundation of any structure (or a minimum of three metres) unless the tank design is certified by a suitably qualified practitioner;

m) All roofwater pipe designs shall ensure that an overflow point located lower than the gutters is provided to ensure that flooding of eaves from gutters overflowing does not occur;

n) All below ground tanks must have sufficient means in place to prevent the backflow of stormwater from the street system into the tank during a storm event;

o) All below ground tanks must be 100% water tight and fully sealed to prevent any ingress of groundwater. All tank openings must be located so that debris and groundwater does not enter the tank;

p) All below ground tanks shall be screened to prevent the breeding of mosquitoes;

q) The pumps attached to the water tank must be placed in a soundproofed enclosure;

r) The tank shall not exceed a height of 2.0 metres from ground level (including the stand for the tank);

s) The tank shall be located at least 450 mm from any property boundary;

t) Pumps are to be covered or screened to avoid noise nuisances to neighbouring properties;

v) Pumps are to comply with *NSW Department of Environment and Conservation (DEC) (2004) Noise Guide for Local Government*;

w) Maintain pressure levels in the pressure vessels to minimise noise disturbance to neighbouring properties;

x) The tank is to be maintained by the property owner to ensure adequate functioning and compliance with accepted health requirements including *NSW Health Guidelines GL2005-033 Rainwater Tanks where a reticulated potable water supply is available*;

y) All plumbing work shall be undertaken by a licensed plumber; and

z) The installation shall comply with Sydney Water requirements.

**Recommended maintenance requirements include:**

a) Regular maintenance of first flush diverters by removing the filter screen in the bottom of the diverter and cleaning. The drip outlet should be monitored for the first 3 rainfall events and adjusted to ensure the diverter is completely drained over a 24 hour period;

b) Annually check performance of the float valve or switch assembly to ensure correct operation at bottom water level as specified;

c) Check the tank overflow outlet every six months to ensure that it is clear of weeds/sediment and other debris;

d) Regularly clean roof gutters to remove leaves, sediment and other debris;

e) The accumulation of sludge at the bottom of the rainwater tank should be checked every two years. The removal of which may be required about once every ten years depending on the amount of sediment entering the tank. This can be undertaken by either pumping or siphoning the sludge or the tank can be drained and then cleaned; and

f) The required frequency of cleaning will depend upon several factors such as local environmental conditions, the condition of the tank inlet and regular performing of other maintenance duties by the owner.

*Note: tanks are considered confined spaces. Access within the tank is to be restricted to personnel with confined spaces training.*

# 8.0 Stormwater harvesting and re-use, permeable surfaces and paving

# 8.0

# Stormwater harvesting and re-use, permeable surfaces and paving

It is recommended that development applications for stormwater harvesting and re-use refer to Managing Urban Stormwater – Harvesting and Re-use (Department of Environment and Conservation 2006) and the *ANZECC and ARMCANZ Australian and New Zealand Guidelines for Recreational Water Quality and Aesthetics*. Further Government guidelines are currently under development.

Development applications for stormwater harvesting and re-use may be assessed in consultation with the relevant government agencies.

**Permeable paving is an alternative to typical impermeable paving. It allows runoff to percolate through to an underlying reservoir for temporary storage until the water is either re-used, infiltrates into the ground or discharges to the stormwater system. Permeable paving provides a number of functions including:**

(a) Removing some sediments and attached pollutants by infiltration through an underlying sand/gravel layer;

(b) Reducing runoff volumes (by infiltration to the sub-soils); and

(c) Delaying runoff peaks by providing retention/detention storage capacity and reducing flow velocities.

Commercially available permeable pavements include pervious/open-graded asphalt, no fines concrete, modular concrete blocks and modular flexible block pavements.

# 9.0 Stormwater quality

# 9.0

# Stormwater quality

## 9.1 Water Sensitive Urban Design (WSUD)

Urbanisation has resulted in an increase in impervious areas in our cities, which in turn, has led to an increase in the speed of stormwater runoff and a reduction in the quality of the runoff. These have had a drastic impact on our urban creeks and waterways. Notable impacts include the erosion of creek banks, increased pollutant levels and loss of aquatic life.

WSUD aims to ensure that developments are designed, built and maintained in a manner that minimises negative changes to the water cycle. WSUD includes technologies such as water efficient fittings and appliances, rainwater tanks to reduce potable water consumption and costs, bioretention systems (also known as raingardens), swales, wetlands, proprietary devices and other approved site-specific measures aimed to reduce pollutant.

**Stormwater runoff in the Waverley LGA discharges into a range of environment types which have high ecological and recreational value. Receiving environments include:**

a) Temperate coastal reef
b) Ocean swimming beaches
c) Sydney Harbour swimming beaches
d) Centennial Parkland Ponds
e) Urban bushland

**Council highly values these environments and endeavours to promote WSUD through all capital works projects and development activities. Section 9.1 is applicable to the following types of development types:**

a) New townhouses and residential flat buildings
b) New commercial, retail mixed use developments
c) New industrial developments
d) Driveways, vehicle parking areas, manoeuvring areas, loading and storage areas that increase the impervious area by 250 $m^2$.

**For water quality control measures, all applicable developments must achieve a minimum of:**

a) 90% reduction in the post development mean annual load of total gross pollutants (greater than 5 mm)
b) 80% reduction in the post development mean annual load of total suspended solids (SS)
c) 55% reduction in the post development mean annual load of total phosphorus (TP)
d) 40% reduction in the post development mean annual load of total nitrogen (TN)

Designers implementing WSUD should use the Model for Urban Stormwater Improvement Conceptualisation and refer to documents including *Using MUSIC in Sydney Drinking Water Catchment* (published by WaterNSW, Parramatta, June 2019). Council's preference is the use of green infrastructure as opposed to grey infrastructure.

Council prefers WSUD measures to be located on private land under the maintenance of the owner or occupier. A maintenance schedule shall be provided to Council and a "Positive Covenant" and "Restriction on the Use of Land" must be created to ensure the on-going future maintenance of WSUD elements. Waverley Council must be nominated as the authority to vary or modify any Restriction and Positive Covenant (see Annexure H).

## 9.2 Managing Stormwater Quality During Construction

Erosion and sedimentation control measures are to be installed and maintained until construction activities have been completed and the site is fully stabilised.

Depending on the extent of disturbed area, one of the following plans to manage erosion and sedimentation must be submitted with the development application.

### *9.2.1 Basic controls plan*

a) For small areas of disturbance (i.e. <250m$^2$ of disturbed area), Council requires at least a hand marked up plan of proposed works and control measures (for example, refer to Annexure D).

b) Basic erosion and sediment controls should be put in place in accordance with the 'Blue Book' (Landcom, 2004).

### *9.2.2 Erosion and sediment control plan (ESCP)*

a) For disturbed areas between 250m$^2$ and 2,500m$^2$, an ESCP must first be prepared for approval and then executed in accordance with the requirements of the 'Blue Book' (Landcom, 2004).

b) All ESCPs should show:

(i) Site layout;

(ii) Approximate location of best management practices (i.e. programs, systems or structures used to mitigate or prevent pollution of receiving waters) where appropriate;

(iii) Where drawings are to scale, show scale at 1:500 or larger;

(iv) Narrative describing how erosion control and soil and water management will be achieved on site, including ongoing maintenance of structures;

(v) Location of site boundaries and adjoining roads;

(vi) Approximate grades and indications of direction(s) of fall;

(vii) Approximate location of trees and other vegetation, showing items for removal or retention;

(viii) Location of site access, proposed roads and other impervious areas (e.g. parking areas and site facilities);

(ix) Existing and proposed drainage patterns with stormwater discharge points; and

(x) North point and scale (if to scale).

(c) On the drawing or in a separate commentary, show how the various soil conservation measures will be carried out on site, including:

(i) Timing of works;

(ii) Locations of lands where a protective ground cover will, as far as is practicable, be maintained;

(iii) Access protection measures;

(iv) Nature and extent of earthworks, including the amount of any cut and fill;

(v) Where applicable, the diversion of runoff from upslope lands around the disturbed areas;

(vi) Location of all soil and other material stockpiles including topsoil storage, protection and reuse methodology;

(vii) Location and type of proposed erosion and sediment control measures;

(viii) Site rehabilitation proposals, including schedules;

(ix) Frequency and nature of any maintenance program;

(x) Other site-specific soil or water conservation structures.

### 9.2.3 Soil and water management plans (SWMP)

a) For disturbed areas >2,500m$^2$, a SWMP must first be prepared for approval and then executed in accordance with the requirements of the 'Blue Book' (Landcom, 2004). In addition to the data requirements for an ESCP (as listed above), further data requirements for the SWMP include:

   (i) Location of lots, public open space, stormwater drainage systems, nearby schools, shopping/ community centres (to assess potential public safety risk);

   (ii) The location of land designated or zoned for special uses;

   (iii) Existing site contours (recommended contour interval is 0.5m on gradients of <15%, 1 metre on gradients of 15 to 30% and 2 metres for slopes >30%);

   (iv) All necessary erosion and sediment control best management practices (BMPs) (location and general diagrammatic representations);

   (v) Location and engineering details with supporting design calculations for all necessary sediment basins. This must include soil testing to determine the type of basin required and whether flocculation will be required;

   (vi) Location and basic details of any other facilities proposed to be included as part of the development or works such as:

      1. constructed wetlands
      2. gross pollutant traps
      3. trash racks or trash collection/separator units
      4. water sensitive" stormwater treatment measures such as bioretention systems,
      5. vegetated swales and infiltration measures

   (vii) Inspection and Test Plans (ITPs) should be presented as an element of the SWMP identifying:

      1. the activity to be undertaken
      2. the standard or specification compliance that is being sought
      3. the relevant acceptance criteria the method of inspection and/or test and the frequency at which it is to be performed
      4. who is responsible for carrying out the inspection and/or test
      5. what documentation is to be produced as a record of the inspection and/or test

   (viii) Any "witness" or "hold points" required during the works should be identified.

(b) The procedures for preparing the SWMPs are set out in the manual prepared by the NSW Department of Housing *'Managing Urban Stormwater, Soils and Construction'* and must be prepared by a suitably experienced person.

### 9.2.4 Additional notes

a) All material deliveries and waste collection should occur on-site. A lease is required from Council prior to storing materials or waste on the footpath.

b) Waste water cannot be discharged to the stormwater system unless it is visually free from grease, oil, solids and unnatural discolouration and free from settleable matter under the *Protection of the Environment Operations Act 1997.*

c) Sediment laden runoff from excavations must be first pumped to an adequately sized sediment basin and treated before discharge.

d) Where non-compliant water is to be pumped from a site, a Trade Waste Permit must be obtained from Sydney Water to dispose of it to the sewer.

e) A copy of the SWMP plan must be kept on the site at all times and be provided to Council Officers on request.

# 10 Seepage and dewatering

# Seepage and dewatering

Seepage water is water percolating through the soil and along rock strata.

Dewatering is the process of removing groundwater from the soil to lower the level of the water table in the area.

## 10.1 Seepage

Sub-soil drainage (from site seepage, planter boxes etc.) must not be discharged directly or indirectly to Council's street gutter.

Sub-soil drainage or seepage water must be restricted from entering all below ground structures with habitable or non-habitable floor spaces and the stormwater drainage system (inclusive of stormwater pits, pipes and/or kerb and gutter), by waterproofing and tanking.

## 10.2 Dewatering

Temporary dewatering involves the removal of groundwater from the site to enable construction works to be undertaken.

Permanent dewatering involves the continual removal of groundwater from the site after construction works have been completed.

### *10.2.1 Information Requirements*

If a proposal involves temporary or permanent dewatering then approval from the relevant NSW Government department will need to be obtained and the development will be considered an integrated development.

**The following information shall be supplied to Council for all dewatering proposals:**

a) The proposed method of construction;

b) The method of dewatering, e.g. pumping from the excavation or a battery of spearpoints around the perimeter of the development site;

c) A plan to scale showing accurately the location of the work(s) in relation to portion and property boundaries;

d) The amount of lowering of the local water table proposed;

e) An estimate of the total volume of groundwater to be pumped from the site (number of kilolitres/megalitres) as well as the instantaneous pumping rate (litres per second) and duration (number of days/weeks/months);

f) Prediction of the impacts of the extraction on any licensed groundwater users or groundwater dependent ecosystems;

g) An assessment of the quality of the groundwater including advice on the presence of any contaminants, testing in a NATA registered laboratory is required;

h) The method of disposal of the tailwater e.g. via street drainage to stormwater system (if so, whether this method of disposal is acceptable to the relevant authority);

i) The compatibility of pumped water and intrinsic groundwater if reinjection is proposed, including advice on the treatment to be applied to remove extant contamination;

j) Geotechnical report identifying risks of off-site impact as a result of the proposed dewatering, i.e. cracks in surrounding buildings or infrastructure as a result of differential sediment compaction and surface settlement following pumping;

k) Treatment/screening; and

l) Hydrogeological and/or geotechnical reports prepared for the development site in support of the Development Application and application for a bore licence.

***Please visit the WaterNSW website for further informaiton regarding dewatering.***

# 11 Groundwater extraction and use

# Groundwater extraction and use

Groundwater is water that exists beneath the surface of the property in underground streams and aquifers.

## 11.1 Groundwater Extraction & Use

Groundwater is a potential alternative water source provided it is utilised in a safe and sustainable manner. However, groundwater can be readily contaminated from a variety of sources in urban areas.

### *11.1.1 Investigations*

**It is recommended that groundwater investigations, including sampling and testing, be undertaken by a suitably qualified practitioner. Investigation requirements include:**

a) Consult local soils (including Acid Sulphate Soils) and geology maps.

b) Undertake a visual historical (recommended 40-60 years) aerial photographic analysis to determine past and present land use, noting any significant land use changes (i.e. removal of vegetation, industry location) that may have affected groundwater in the area.

c) Contact the relevant NSW Government department to identify registered bores in the area.

d) Contact the relevant NSW Government department and request an assessment of local groundwater conditions (i.e. groundwater flow direction, known sustainable yield capacity etc.).

e) Undertake a thorough site inspection.

f) Verify any known groundwater bores. If any unknown bores are located during site investigation, contact the relevant NSW Government department so the bore can be recorded.

g) Undertake an assessment of sustainable yield

h) Undertake water quality sampling against ANZECC guidelines for recreation/irrigation.

i) Verify any known or likely locations of Acid Sulphate Soils or other contaminated lands.

j) Undertake an assessment of potential drawdown of known surrounding bores.

k) Where relevant, assess groundwater dependent ecosystems.

l) Identify bore drilling costs and design.

### *11.1.2 Installation*

**Recommended groundwater bore installation checklist for proponents:**

### *11.1.3 Before commencing work*

a) Development consent obtained from Council.

b) Bore licence obtained

c) Below ground services locations checked (call 1100)

d) Drillers licence viewed, classification appropriate

### *11.1.4 During work*

a) Bore designed and constructed in accordance with *Minimum Construction Requirements for Water Bores in Australia - 2nd Edition.*

b) Water quality sample collected

> *Note: It is recommended that the natural background levels of the groundwater be tested against the appropriate guidelines such as the 'ANZECC and ARMCANZ Australian and New Zealand Guidelines for Recreational Water Quality and Aesthetics or based on independent consultant's advice'. Follow up testing (e.g. seasonal testing) should be undertaken to ensure that the groundwater resource is not deteriorating in quality or quantity.*

c) Tailwater (discharge water) controlled on-site and disposed of appropriately.

### *11.1.5 After completing work*

a) 'Form A – Particulars of Completed Work', completed and signed and copy forwarded to the relevant NSW Government department office.

b) Water quality sample submitted to NATA registered laboratory and copy of results forwarded to the relevant NSW Government department office.

c) Bore hydraulic testing carried out in accordance with *AS2358-1900 Test Pumping of Water Wells.*

d) Bore decommissioned in accordance with *Minimum Construction Requirements for Water Bores in Australia – 2nd Edition* if decision is made to abandon the work.

# 12 Greywater re-use

# Greywater re-use

Greywater is increasingly recognised as a water resource for household use. Greywater reuse can have significant health and environmental risks and must be managed appropriately.

## 12.1 Health and environmental risks of greywater

Greywater contains a variety of types and concentrations of waste materials that pose risks to human health and the environment. A brief summary of greywater characteristics is outlined in the Table 12-1.

High levels of Biological Oxygen Demand (BOD) and Chemical Oxygen Demand (COD) in greywater have the potential to cause anaerobic conditions resulting in offensive odours. Nutrients (phosphates, nitrates and ammonia), salts and other chemicals disposed of in greywater have significant impacts on the environment, including ecological impacts such as contamination of waterways and groundwater and detrimental impacts on organisms and their habitat. High nutrient loads and water loads can create advantageous conditions for weed invasion. Additionally, high levels of salts can prevent plant growth and destroy soil structure, leading to loss of water holding capacity and leaching of organic matter.

The minimum levels of treatment and appropriate end users are shown in Table 12-2.

**Table 12-1: Summary of Greywater Characteristics**

| Greywater Sources | Physical pollution | Chemical pollution | Microbial contamination |
|---|---|---|---|
| **Kitchen** | Heavily polluted with physical materials, such as particulate matter, food scraps, fats and oils. | Polluted with detergents and household chemicals. Possibly highly alkaline and high in phosphorous. | High in microbiological organisms which may be pathogenic (disease carrying). |
| **Laundry** | Polluted with lint and particulate matter. | Possibly high in salts, phosphates, nitrates and ammonia. | High level of microbial organisms if used for nappy washing, or from first rinse.<br>Second rinse is cleaner. |
| **Bathroom (shower/hand basin only)** | Polluted with particulate matter, hair and skin. | Contaminated with soaps, shampoo, toothpaste and hair dyes. | Microorganism count can be high.<br>Urine may be present, but transmission of infectious organisms is remote. |

**Table 12-2: Minimum Treatment Levels and Suitable Greywater Reuse Application**

| Greywater Sources | Physical pollution | Chemical pollution |
|---|---|---|
| • **sub-surface irrigation** | Greywater diversion device | Coarsely filtered untreated greywater (excluding kitchen greywater) |
| • **sub-surface irrigation**<br>• **surface irrigation** | Greywater treatment system | Treated and disinfected greywater<br>• 20 mg/L BOD5<br>• 30 mg/L SS<br>• 30 cfu/ 100mL thermotolerant coliforms |
| • **sub-surface irrigation**<br>• **surface irrigation**<br>• **toilet flushing**<br>• **laundry use** | Greywater treatment system | Treated and disinfected greywater<br>• 20 mg/L BOD5<br>• 30 mg/L SS<br>• 10 cfu/ 100mL thermotolerant coliforms |

*Note: Greywater sourced from laundry systems may contain high concentrations of salt. Utilisation of low salt laundry detergent or occasional discharge to the sewer may be required in order to prevent build up of salt concentrations.*

*General installation, operation and maintenance requirements for greywater diversion devices and greywater treatment systems are outlined in Table 12-3 and 12-4.*

**Table 12-3: General Installation, Operation and Maintenance requirements for Manual Greywater Bucketing and Greywater Diversion Devices.**

| Requirements | Manual Greywater Bucketing | Greywater Diversion Device | Pump Diversion Device |
|---|---|---|---|
| **Council approval** | ✓ | | |
| **Council approval required if NOT compliant with Local Government** (General) Regulation 2005 (75A) | | ✓ | ✓ |
| **Installation by a licensed plumber** | | ✓ | ✓ |
| **Sydney Water compliance** | ✓ | ✓ | ✓ |
| **WaterMark Licensed Device (formerly a Plumbing Safety License) & NSW Health listed** | | ✓ | ✓ |
| **Government Policy Compliance** | | | |
| **Guidelines for Greywater Reuse in Sewered Single Household Residential Premises** (NSW DEUS 2007) | | ✓ | ✓ |
| **On-site Sewage Management for Single Households** (Environment & Health Protection Guidelines 1998) | | | ✓ |

## 12.2 Manual bucketing

Small quantities of greywater (sourced from shower and laundry water) may be manually utilized (using a bucket or similar) to irrigate gardens, lawns and outdoor pot plants.

## 12.3 Greywater diversion devices

Greywater Diversion Devices (GDD) must divert all greywater to a subsurface irrigation system. GDD include gravity diversion devices and pump diversion devices.

**To find out if you need to submit a development application to Council refer to Part G4 – Water Management in Waverley DCP 2006. The following applies to all greywater diversion devices:**

a) Greywater must be used immediately and not stored.

b) Must be installed, operated and maintained in accordance with the requirements outlined in Table 13-3.

c) Reuse of greywater using a diversion device is only permitted for single residential dwellings.

### *12.3.1 Gravity diversion devices*

A gravity diversion device incorporates a hand activated valve, switch or tap which is fitted to the outlet of the waste pipe of the plumbing fixture such as a laundry tub.

Gravity diversion devices must not be installed above the "S" bend on any plumbing fitting as this would allow sewer gases to enter the home with potentially fatal consequences.

### *12.3.2 Pump diversion devices*

A pump diversion device incorporates a surge tank to cope with sudden influxes of greywater for distribution by a pump to a sub-surface land application system.

a) Kitchen greywater is not suitable for collection in a pump diversion device because it will clog the device with fats, oils and food particles. Residues in the device cause foul odours and provide attraction for vermin.

b) The surge tank must not operate as a storage tank.

c) The greywater should be screened as it enters a surge tank for distribution by a pump to the sub-surface land application system.

## 12.4 Greywater treatment systems

**A greywater treatment system collects, stores, treats and may disinfect all or any of the sources of greywater. The following applies to all greywater treatment systems:**

a) An example greywater treatment system Positive Covenant template is included as Annexure F.

b) Must be installed, operated and maintained in accordance with the requirements outlined in Table 13-4. Note that the NSW Government greywater policy and regulatory framework is currently under review.

c) A development application is required by Council to install and operate a greywater treatment system.

d) It is not permissible to store untreated or raw greywater for greater than 24 hours before treatment.

e) An environmental health risk assessment may be required where there are potential public health risks.

f) An overflow to the Sydney Water sewerage system must be maintained at all times to enable the grey water device to be maintained or turned off if required. In this regard, Council may require an emergency contact in case of malfunction.

g) Any grey water treatment system must be approved by NSW Health.

h) All plumbing and drainage must be undertaken in accordance with Sydney Water requirements.

i) Cross connection control and backflow prevention with the potable reticulated water supply must be installed in accordance with Sydney Water requirements.

j) A strategy to demonstrate effective performance of the greywater treatment system must be submitted with the development application.

k) Owners must arrange for annual inspections to be undertaken by the manufacturer to ensure that the greywater treatment system is working in accordance with NSW Government requirements. This will be undertaken at the owners' expense.

l) A greywater system may be inspected by an appropriate Council officer at any time.

### *12.4.1 Single dwellings*

**Domestic greywater treatment systems (DGTS) for single dwellings:**

a) Are permitted on single premises of a domestic nature normally occupied by less than 10 persons or have an average daily flow of sewage of less than 2,000 litres.

b) Require a NSW Health Certificate of Accreditation.

### *13.4.2 Multi-unit dwellings*

Applies to greywater recycling systems with a processing capacity of less than 2,500 persons equivalent capacity or 750 kilolitres per day. A system that exceeds this processing capacity or volume, and that involve the discharge of wastes or by-products to land or waters are subject to the NSW Government requirements under the Protection of the Environment Operations Act 1997.

### *12.4.3 Commercial and industrial settings*

Greywater and sewage recycling systems in commercial and industrial settings will be assessed on a merit basis in accordance with current government policy and in consultation with relevant government agencies.

### *12.4.4 Land application system*

A land application system is the area to be used, either for sub-surface or surface irrigation of treated or untreated greywater.

An assessment of the potential for groundwater contamination must be submitted with the development application. A long term decline in the ground water quality will not be accepted.

### *12.4.5 Miscellaneous reuse*

Council will consider other proposals for greywater re-use (e.g. re-use on playing fields, reuse of swimming pool back wash, and reuse of water in cooling towers) on a merit basis, in consultation with relevant government agencies.

**Table 13-2: General Installation, Operation and Maintenance requirements for Greywater Treatment Systems.**

| Requirements | Single Dwellings | Land Application | Multi-Unit Dwellings | Commercial & Industrial Sites |
|---|---|---|---|---|
| **Council approval** | ✓ | ✓ | ✓ | ✓ |
| **Installation by a licensed plumber** | ✓ | ✓ | ✓ | ✓ |
| **Sydney Water compliance** | ✓ | ✓ | ✓ | ✓ |
| **NSW Health Greywater Treatment System Certificate of Accreditation** | ✓ | ✓ | ✓ | ✓ |
| **Government Policy Compliance** | | | | |
| **Greywater Re-use in Sewered Single Domestic Premises** (NSW Health 2000) | ✓ | | | |
| **On-site Sewage Management for Single Households** (Environment & Health Protection Guidelines 1998) | ✓ | | | |
| **Use of Effluent by Irrigation** (NSW DEC 1998) | | ✓ | | |
| **Greywater and Sewage Recycling in Multi-Unit Dwellings and Commercial Premises - Interim Guidance** (NSW Health Department Circular 2005) | | | ✓ | ✓ |

# 13 Blackwater re-use

# Blackwater re-use

Blackwater reuse can have significant health and environmental risks and must be managed appropriately.

a) An example blackwater treatment system Positive Covenant template is included as Annexure G.

b) Blackwater treatment systems must be NSW Health Accredited.

c) Must be installed, operated and maintained in accordance with the requirements outlined in Table 13-1. Note that the NSW Government blackwater policy and regulatory framework is currently under review.

**Table 13-1: Blackwater Policy Requirements**

| Greywater Sources | Physical pollution | Chemical pollution | Microbial contamination |
|---|---|---|---|
| *'Environment and Health Protection Guidelines: On-site Sewage Management for Single Households'* (NSW DLG 1998) | *'Environmental Guidelines: Use of Effluent by Irrigation'* (NSW DEC 2004)<br>*'Effluent Treatment Standard Required for Land Application Systems: Advisory Note 4 – Sewage Management Facility Accreditation Criteria Based on the Final Application of Treated Effluent and Risk of Disease Transmission'* (NSW Health 2006) | *'Interim Guidance for Greywater and Sewage Recycling in Multi-Unit Dwellings and Commercial Premises'* (NSW Health 2004)<br>*'Draft Management of Private Decentralised Recycled Water Systems Regulatory Framework'* (NSW DEUS 2006) | *'Interim Guidance for Greywater and Sewage Recycling in Multi-Unit Dwellings and Commercial Premises'* (NSW Health 2004)<br>*'Draft Management of Private Decentralised Recycled Water Systems Regulatory Framework'* (NSW DEUS 2006) |
| *'National Water Quality Management Strategy Guidelines for Water Recycling: Managing Health and Environmental Risks'* (EPHC-NRMCC 2006) | *'National Water Quality Management Strategy Guidelines for Water Recycling: Managing Health and Environmental Risks'* (EPHC-NRMCC 2006) | *'National Water Quality Management Strategy Guidelines for Water Recycling: Managing Health and Environmental Risks'* (EPHC-NRMCC 2006) | *'National Water Quality Management Strategy Guidelines for Water Recycling: Managing Health and Environmental Risks'* (EPHC-NRMCC 2006) |

d) A water meter must be installed at the discharge point of the STP to monitor daily wastewater loads.

e) It is recommended that two flow meters (or a tipping bucket for the sewer) be installed to measure effluent volumes, one on the effluent irrigation line and one on the overflow to the sewage system. These meters must be:

   (i) read and recorded quarterly; and

   (ii) analysed by the manufacturer in accordance with the monitoring regime outlined in 12(i) to ensure the system is adequate to treat effluent volumes being produced.

f) A dedicated pipe to remove sludge must be:

   (i) installed and fitted at the base of the waste treatment tank;

   (ii) no higher than 150mm from the base and running to the front of the house;

   (iii) no further than 0.5m from the front boundary alignment; and

   (iv) fitted with an airtight Kamlock, or similar, to enable sludge to be removed by pump out vehicles as needed or required by Council.

g) The overflow from the waste system shall be and remain connected to the existing mains sewage system.

h) Should the system fail to remove sludge or should the irrigation water quality not meet the required standards then Council may, at its discretion, direct the owner to:

   (i) cease using the system; and

   (ii) direct all sewage to the existing mains sewer; and

   (iii) to completely remove all sludge and sewage from the waste system.

i) Owners must arrange for monitoring to be undertaken by the manufacturer to ensure that the blackwater treatment system is working in accordance with the target effluent quality outlined in Table 14-2. Quarterly monitoring must be undertaken for the first 12 months and, subject to the results being to the satisfaction of Council, annual monitoring thereafter. This will be undertaken at the owners' expense.

**Table 13-2: Blackwater system monitoring targets**

| Parameter for monitoring | Target |
|---|---|
| BOD5 | < 10 mg/L |
| Suspended Solids | < 10 mg/L |
| pH | 6.5 to 8.5 |
| Total Nitrogen | < 15 mg/L |

j) Monitoring data, including copies of the laboratory results, must be provided to Council. A copy of each result must be kept on site in chronological order in a bound, waterproof site book which is kept in a weatherproof cabinet located externally to the dwelling within 5 metres of the blackwater treatment system and accessible to Council Officers for inspection.

# 14 References

# References


Australian and New Zealand Environment and Conservation Council (ANZECC) and Agriculture and Resource Management Council of Australia and New Zealand (ARMCANZ) (1992).
*Australian and New Zealand Guidelines for Fresh and Marine Water Quality.*

BASIX website http:www.basix.nsw.gov.au

Berkenhagen J., Fohrer N., Martin Hecker J., Rudolph A. (1999) Changing soil and Surface Conditions during Rainfall, *Catena 37(3-4) pp 355-375.*

Committee on Uniformity of Plumbing and Drainage Regulations (CUPDR) (September 2003)
*Circular No. 18 Guidelines for Plumbing Associated with Rainwater Tanks in Urban Areas (Where a Reticulated Potable Water Supply is Installed).*

Department of Environmental Quality Michigan (2005)
*Stormwater Management Guidebook, Chapter 4, pp 32-37.*

Environment Protection and Heritage Council (2006)
*National Water Quality Management Strategy Guidelines for Water Recycling: Managing Health and Environmental Risks.*

Environment & Health Protection Guidelines (1998)
*On-site Sewage Management for Single Households.*

HWA GeoSciences Inc (1998) Infiltration Rates: Part 2, *Geoinsight.*

Institution of Engineers (2003)
*Draft Australian Runoff Quality.*

Landcom (2004)
*Managing Urban Stormwater: Soils and Construction Volume 14th Edition (the Blue Book).*

LWBC (2003)
*Minimum Construction Requirements for Water Bores in Australia - 2nd Edition.*

NSW Department of Environment and Conservation (1998)
*Use of Effluent by Irrigation.*

NSW Department of Energy, Utilities and Sustainability (2006)
*Draft Regulatory Framework – Management of Private Decentralised Recycled Water Systems.*

NSW Department of Energy, Utilities and Sustainability (2007)
*Guidelines for Greywater Reuse in Sewered Single Household Residential Premises.*

NSW Department of Local Government (1998)
*Environment and Health Protection Guidelines: On-site Sewage Management for Single Households.*

NSW Department of Local Government (2004)
*Circular to Councils 04/25 Approvals for Installation and Operation of Systems of Sewage Management (Including Greywater Diversion Devices).*

NSW Environment Protection Authority (1997)
*Draft Managing Urban Stormwater: Treatment Techniques.*

NSW Health (2000)
*Greywater Reuse in Sewered Single Domestic Premises.*

NSW Health (2004)
*Interim Guidance for Greywater and Sewage Recycling in Multi-Unit Dwellings and Commercial Premises.*

NSW Health Department Circular (2005)
*Greywater and Sewage Recycling in Multi-Unit Dwellings and Commercial Premises - Interim Guidance.*

NSW Health (2006)
*Effluent Treatment Standard Required for Land Application Systems: Advisory Note 4 – Sewage Management Facility Accreditation Criteria Based on the Final Application of Treated Effluent and Risk of Disease Transmission.*

NSW Health (2007)
*Guidelines GL2005-033 Rainwater Tanks where a reticulated potable water supply is available.*

Standards Australia (1989) Australian Standard:
*Loads on Buried Concrete Pipes AS 3725:1989.*

Standards Australia (1992) Australian Standard:
*Fixed platforms, walkways, stairways and ladders – Design, construction and installation AS 1657-1992.*

Standards Australia (1997) Australian Standard:
*Installation of UPVC Pipes AS 2032:1997*

Standards Australia (2003) Australian Standard:
*National Plumbing and Drainage AS/NZS 3500:2003.*

Sydney Coastal Councils Group & Groundwater Working Group (2005).
*Draft Sydney Regional Groundwater Management Handbook – A Guide for Local Government.*

URS Australia (2004)
*Water Sensitive Urban Design Technical Guidelines for Western Sydney.*

WaterNSW (2019)
*Using MUSIC in Sydney's Drinking Water Catchment – A Sydney Catchment Authority Standard.*

# 15 Annexures

## 15.1 ANNEXURE A – Intensity frequency duration data

Waverley Bowling Club 05/05/99

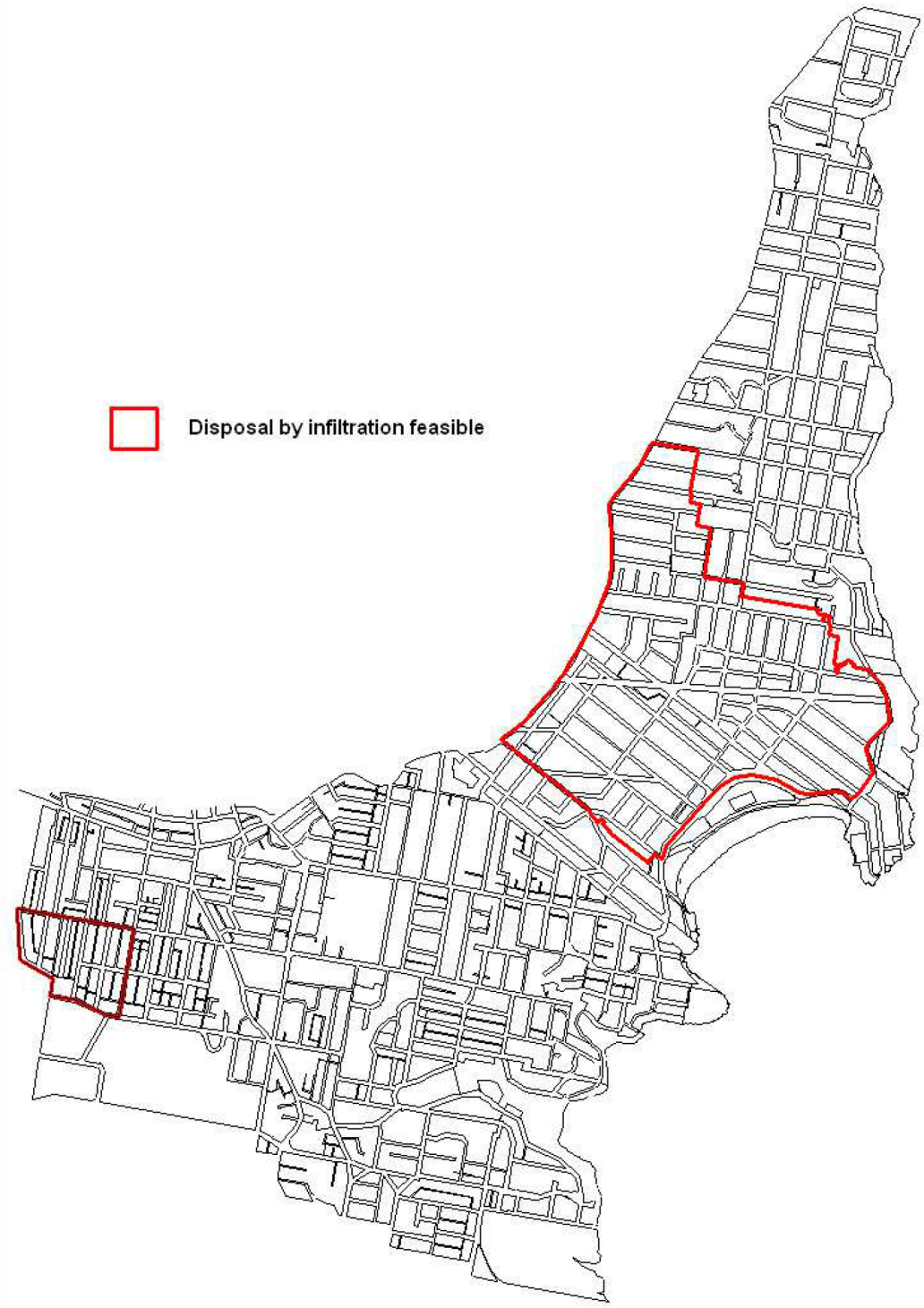
| | | | | | |
|---|---|---|---|---|---|
| Site data | 2I1=42.5 | 2I12=8.22 | 2I72=2.50 | 50I1=88.1 | 50I12=16.6 |
| | 50I72=5.03 | REGSKEW=0.00 | F2=4.29 | F50=15.86 | C10=0.81 |

| Storm Duration | Average Storm Recurrence Interval (years) Rainfall Intensities in millimetres/hour | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
| 2 min | 138.41 | 175.87 | 218.47 | 242.16 | 274.50 | 316.08 | 347.23 |
| 3 | 123.20 | 156.82 | 195.73 | 217.50 | 247.04 | 285.11 | 313.69 |
| 4 | 112.59 | 143.51 | 179.77 | 200.15 | 227.70 | 263.26 | 289.99 |
| 5 | 104.49 | 133.34 | 167.54 | 186.82 | 212.81 | 246.41 | 271.70 |
| 6 | 98.04 | 125.23 | 157.76 | 176.15 | 200.88 | 232.89 | 257.01 |
| 7 | 92.60 | 118.39 | 149.48 | 167.11 | 190.76 | 221.41 | 244.52 |
| 8 | 87.94 | 112.52 | 142.37 | 159.34 | 182.05 | 211.51 | 233.75 |
| 9 | 83.88 | 107.41 | 136.16 | 152.54 | 174.43 | 202.85 | 224.31 |
| 10 | 80.37 | 102.97 | 130.76 | 146.63 | 167.80 | 195.30 | 216.09 |
| 11 | 77.25 | 99.04 | 125.97 | 141.38 | 161.90 | 188.58 | 208.76 |
| 12 | 74.34 | 95.36 | 121.48 | 136.45 | 156.36 | 182.27 | 201.87 |
| 13 | 71.77 | 92.12 | 117.52 | 132.09 | 151.46 | 176.68 | 195.78 |
| 14 | 69.44 | 89.18 | 113.92 | 128.14 | 147.01 | 171.60 | 190.23 |
| 15 | 67.27 | 86.42 | 110.54 | 124.43 | 142.83 | 166.83 | 185.02 |
| 16 | 65.30 | 83.94 | 107.49 | 121.07 | 139.05 | 162.50 | 180.29 |
| 17 | 63.46 | 81.61 | 104.63 | 117.92 | 135.50 | 158.45 | 175.86 |
| 18 | 61.81 | 79.52 | 102.06 | 115.09 | 123.31 | 154.79 | 171.86 |
| 20 | 58.70 | 75.58 | 97.21 | 109.73 | 126.27 | 147.87 | 164.29 |
| 25 | 52.54 | 67.76 | 87.54 | 99.06 | 114.20 | 134.04 | 149.13 |
| 30 | 47.81 | 61.74 | 80.08 | 90.79 | 104.84 | 123.28 | 137.34 |
| 35 | 44.07 | 56.99 | 74.16 | 84.23 | 97.41 | 114.72 | 127.94 |
| 40 | 40.99 | 53.07 | 69.26 | 78.78 | 91.22 | 107.59 | 120.10 |
| 45 | 38.42 | 49.79 | 65.15 | 74.20 | 86.02 | 101.59 | 113.50 |
| 50 | 36.25 | 47.01 | 61.66 | 70.32 | 81.61 | 96.48 | 107.88 |
| 60 | 32.69 | 42.47 | 55.94 | 63.93 | 74.32 | 88.05 | 98.58 |
| 90 | 25.20 | 32.71 | 43.00 | 49.10 | 57.03 | 67.51 | 75.54 |

| Storm Duration | Average Storm Recurrence Interval (years) Rainfall Intensities in millimetres/hour | | | | | | |
|---|---|---|---|---|---|---|---|
| | 1 | 2 | 5 | 10 | 20 | 50 | 100 |
| 2 hours | 20.87 | 27.08 | 35.55 | 40.56 | 47.09 | 55.71 | 62.30 |
| 3 | 15.95 | 20.68 | 27.10 | 30.89 | 35.84 | 42.35 | 47.34 |
| 4 | 13.17 | 17.07 | 22.33 | 25.44 | 29.49 | 34.83 | 38.91 |
| 4.5 | 12.17 | 15.77 | 20.63 | 23.49 | 27.23 | 32.15 | 35.91 |
| 6 | 10.05 | 13.01 | 17.00 | 19.34 | 22.41 | 26.44 | 29.52 |
| 9 | 7.68 | 9.94 | 12.96 | 14.73 | 17.05 | 20.10 | 22.43 |
| 12 | 6.35 | 8.22 | 10.70 | 12.15 | 14.06 | 16.56 | 18.47 |
| 14 | 5.77 | 7.46 | 9.71 | 11.03 | 12.76 | 15.03 | 16.77 |
| 16 | 5.31 | 6.87 | 8.94 | 10.15 | 11.74 | 13.83 | 15.43 |
| 18 | 4.93 | 6.38 | 8.30 | 9.43 | 10.91 | 12.85 | 14.33 |
| 20 | 4.62 | 5.97 | 7.77 | 8.83 | 10.21 | 12.03 | 13.42 |
| 22 | 4.35 | 5.62 | 7.32 | 8.31 | 9.61 | 11.32 | 12.63 |
| 24 | 4.12 | 5.32 | 6.93 | 7.87 | 9.10 | 10.72 | 11.95 |
| 30 | 3.56 | 4.60 | 5.98 | 6.80 | 7.86 | 9.26 | 10.32 |
| 36 | 3.16 | 4.09 | 5.32 | 6.04 | 6.99 | 8.23 | 9.17 |
| 48 | 2.60 | 3.36 | 4.38 | 4.97 | 5.75 | 6.77 | 7.55 |
| 60 | 2.22 | 2.87 | 3.73 | 4.24 | 4.90 | 5.77 | 6.43 |
| 72 | 1.93 | 2.50 | 3.25 | 3.69 | 4.27 | 5.03 | 5.61 |

Note: The above rainfall intensities were derived using the procedures described in Chapter 2 of the Institute of Engineers Australia, publication, 'Australian Rainfall & Runoff', 1987 ed.

## 15.2 ANNEXURE B – Infiltration Map



## 15.3 ANNEXURE C – Stormwater management plan checklist

The information requested on this form must be submitted to Council with stormwater management plans when lodging your Development Application and Construction Certification. Please tick and sign the appropriate box and attach the information as requested.

| Property and Development Details | | | |
|---|---|---|---|
| Street Address | Unit No. | Street No. | Street |
| | Suburb | | Postcode |
| Type of Development | | | |
| **Designer Details** | | | |
| Ms/Mr/Mrs/ Other (please circle) | Given Name(s) | | Surname |
| | Mobile No. | | Other No. |
| | Email Address | | |
| Street Address | Unit No. | Street No. | Street |
| | Suburb | | Postcode |
| Company Name (if applicable) | | | |
| Mailing Address (if different) | Unit No. | Street No. | Street |
| | Suburb | | Postcode |

I certify that the drainage design is in accordance with Waverley Council's Water Management Technical Manual (WMTM) and Development Control Plan (DCP) and that I am a suitably qualified and practicing Engineer.

| Design Certification | |
|---|---|
| Designer's Name | Signature |
| Professional Qualifications | Date / / |
| Accreditation Organisation | Accreditation Reference |
| Contact Details (if different to designer above) | |

### Privacy Statement

The personal information provided on this form (including your name and other details) will be handled in accordance with the Privacy and Personal Information Protection Act 1998 and may be available to the public under various legislation. Refer also to the Privacy Statement on Council's website.

## Stormwater Management Plan Checklist

Property Address _____ Date / /

Mark table section as applicable where the designer is unable to comply with a WMTM or DCP requirement. Additional information is to be provided to Council to justify the non-compliance. Incorrectly or falsely completing this checklist may lead to rejection/delay of the Development Application/Construction Certificate.

| Manual Requirements | Applicable (Yes/No) | Provided (Yes/No) | If no, Reason for variation |
|---|---|---|---|
| **Site Plan** | | | |
| Is the plan consistent with the architectural plans and landscape plans (no conflict between stormwater infrastructure, trees to be retained or planted and landscaped areas including deep soil)? | | | |
| Pre-Development impervious area calculation | | | |
| Post-Development impervious area calculation | | | |
| North arrow | | | |
| Contours and spot levels | | | |
| Building envelope | | | |
| Habitable and non-habitable finished floor levels (FFLs). | | | |
| Easements/Major Services | | | |
| **Roof Drainage Systems** | | | |
| Roof catchment | | | |
| Roof runoff | | | |
| Eave, box and valley gutter size and details | | | |
| Downpipe, sizing, location & spacing | | | |
| **Surface Drainage Systems** | | | |
| Pipe size | | | |
| Pipe grade | | | |
| Pipe class | | | |
| Pipe cover | | | |
| Pipe flow | | | |
| Pit/inspection opening location | | | |
| Pit/inspection opening size | | | |

| Manual Requirements | Applicable (Yes/No) | Provided (Yes/No) | If no, Reason for variation |
|---|---|---|---|
| **Surface Drainage Systems** | | | |
| Pit/inspection opening invert levels | | | |
| Pit/inspection opening surface levels | | | |
| Pit/inspection opening detail/section | | | |
| Sediment control pit at boundary | | | |
| Grated trench drain across garage entrance/ driveway/street boundary within private property | | | |
| **Rainwater Reuse Systems** | | | |
| BASIX or rainwater tank requirements | | | |
| Rainwater tank location | | | |
| Rainwater tank overflow detail | | | |

**THERE IS NO REQUIREMENT TO FILL OUT THE CHECKLIST PAST THIS POINT UNLESS**

**Your development is:**

- On flood affected land
- You have a Council/Sydney Water owned stormwater pipe traversing the site.

**OR**

**You require any of the following systems:**

- On-site stormwater detention
- Infiltration system
- Charged system
- Pump out system
- Interallotment drainage
- Water quality controls

| Manual Requirements | Applicable (Yes/No) | State the value or (Yes/ No) where applicable | If no, please provide a reason |
|---|---|---|---|
| **Site Plan** | | | |
| What is the total site area ($m^2$)? | | | |
| Have you checked to see if the property is on land identified as flood affected? | | | |
| Does the property fall to the street? | | | |
| Has the location of OSD, infiltration or pump out system been provided? | | | |
| Has a catchment plan clarifying the impervious and pervious draining to and bypassing the proposed system(s) been provided? | | | |
| Have you checked to ensure the FFLs noted in the stormwater management plan are consistent with the FFLs noted in the architectural drawings? | | | |
| **Additional questions for flood affected land** | | | |
| Have flood levels been obtained from Council? | | | |
| Has a flood impact assessment prepared by a suitably qualified and practising Engineer with experience with floodplain risk management and two-dimensional flood modelling been provided? | | | |
| If flood modelling is required, has Council's TUFLOW model been utilised as per the DCP? | | | |

| Manual Requirements | Applicable (Yes/No) | State the value or (Yes/ No) where applicable | If no, please provide a reason |
|---|---|---|---|
| **Additional questions for low level properties** (See Section 4 for further guidance) | | | |
| Has an honest and reasonable attempt been made to acquire an easement through any of the downstream properties or demonstrated that all avenues to establish an easement be impractical or unviable? | | | |
| If the site already benefits from an existing drainage easement, has a recent Title Search been provided? | | | |
| **Additional questions for on-site stormwater detention (OSD) systems** (See Section 6 for further guidance) | | | |
| Which of the following have been utilised: an above ground OSD tank (only allowed for detached, semi-attached or attached dwellings or secondary dwellings), above ground OSD basin or below ground OSD tank? | | | |
| Has the OSD system been sized to cater for the 1% AEP storm event? | | | |
| What is the total impervious area ($m^2$) in the pre-development state? | | | |
| What is the total impervious area ($m^2$) in the post-development state? | | | |
| What is the permissible site discharge (PSD) under the undeveloped site conditions (calculated using the 20% AEP event rainfall data)? | | | |
| Is the PSD less than 25 L/s? | | | |
| What is the total area ($m^2$) bypassing the OSD system? | | | |
| What is the total impervious area ($m^2$) bypassing the OSD system? | | | |
| What is the rate of runoff bypassing the OSD system (calculated using the 1% AEP event rainfall data)? | | | |
| What is the total area ($m^2$) draining to the OSD system? | | | |
| What is the total impervious area ($m^2$) draining to the OSD system? | | | |

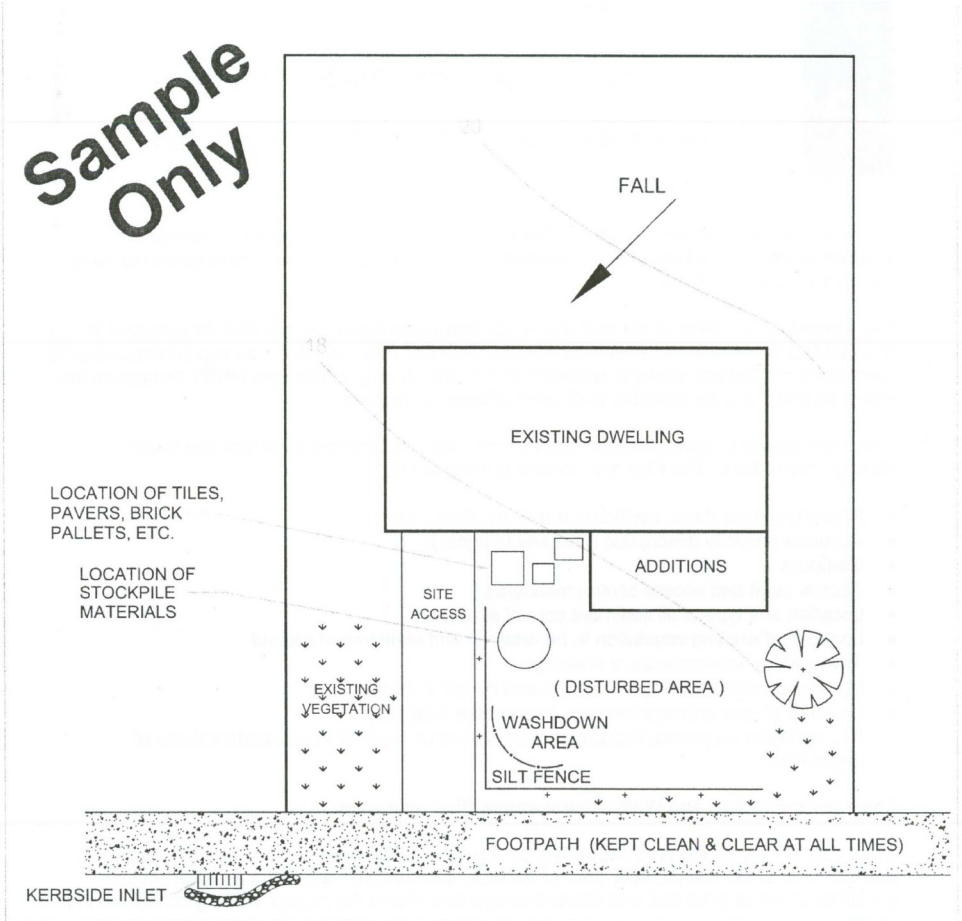
| Manual Requirements | Applicable (Yes/No) | State the value or (Yes/ No) where applicable | If no, please provide a reason |
|---|---|---|---|
| **Additional questions for on-site stormwater detention (OSD) systems** | | | |
| What is the proposed volume of the OSD system ($m^3$)? | | | |
| What is the depth from the top water level to the centreline of the orifice (m)? | | | |
| What is the diameter of the orifice (mm)? | | | |
| What is the discharge rate from the OSD system? | | | |
| Is the summation of the discharge rate from the OSD system and rate of runoff bypassing the OSD system less than the PSD? | | | |
| Has the OSD system been designed without a high-early discharge (HED) chamber? | | | |
| Has a plan view of the OSD system that notes its dimensions and the level of the base at each extent been provided? | | | |
| Has at least one section of the OSD system been provided and drawn at a suitable scale? | | | |
| Does the section note/depict the following (where applicable):<br>• Size of access grate(s)<br>• Surface level<br>• Soffit level<br>• Top water level<br>• Centreline of orifice<br>• Invert of orifice<br>• Diameter of orifice<br>• Base with 1% fall<br>• Base at same level as centreline of orifice<br>• Trash screen<br>• Sump with weepholes | | | |
| What is the FFL of the habitable areas of the dwelling? | | | |
| What is the FFL of the non-habitable areas of the dwelling? | | | |
| What is the soffit of the system? | | | |
| What is the top water level of the OSD system? | | | |

| Manual Requirements | Applicable (Yes/No) | State the value or (Yes/ No) where applicable | If no, please provide a reason |
|---|---|---|---|
| **Additional questions for on-site stormwater detention (OSD) systems** | | | |
| Has 150 mm and 300 mm freeboard been provided to the non-habitable and habitable areas of the building respectively? | | | |
| Is the surface level of the pit(s) upstream at least 100 mm higher than the top water level? | | | |
| Has an overflow weir or overflow pipe laid horizontally across the wall at the nominated overflow invert level been provided? | | | |
| What is the centreline level of the orifice? | | | |
| Is the invert level of the orifice/outlet pipe at least 100 mm above the HGL at the discharge point? | | | |
| Is a detail of the orifice plate provided? | | | |
| Has a Confined Spaces sign, OSD Plaque and OSD Warning sign been provided? | | | |
| Is a detail of a trash screen provided? | | | |
| Has the volume of the above ground OSD basin been increased by 20% (only applicable if landscaped)? | | | |
| Has subsoil drainage been provided for the above ground OSD basin (only applicable if landscaped)? | | | |
| Have at least two access grates been provided (only applicable if below ground OSD tank)? | | | |
| Have step irons been provided for the below ground OSD tank (when depth is > 1.2 m)? | | | |
| **Additional questions for Infiltration system** (See Section 4.7 for further guidance) | | | |
| Is the design supported by a geotechnical report? | | | |
| What is the infiltration rate? | | | |
| Has the rate used to size the infiltration system been reduced by 50%? | | | |
| What is the volume of the infiltration system? | | | |

| Manual Requirements | Applicable (Yes/No) | State the value or (Yes/ No) where applicable | If no, please provide a reason |
|---|---|---|---|
| **Additional questions for Infiltration system** | | | |
| Has the roof guttering and downpipe system been designed to collect the 1% AEP rainfall event and pipe it to the absorption system? | | | |
| Has a plan view of the infiltration system that notes its dimensions been provided? | | | |
| Has a section drawn at a suitable scale been provided? | | | |
| Is silt arrestor pit proposed upstream of the system? | | | |
| Is the distance between the infiltration system and the property boundary compliant? | | | |
| Has a registered Structural Engineer determined the minimum distance to structural footings? | | | |
| Is the infiltration system at least one metre away of any Sydney Water Sewer main? | | | |
| **Additional questions for charged system** (See Section 4.8 for further guidance) | | | |
| Are all gutters, downpipes in the system designed to cater for a 1% AEP event? | | | |
| Are the levels of the roof gutter noted? | | | |
| Is there at least a difference of 2.0 metres in height between the roof gutter and the surface level of the discharge pit at the property boundary? | | | |
| If previously answered no, has a hydraulic grade line (HGL) analysis been undertaken? | | | |
| Is there gravity flow from the property boundary to the street kerb and gutter? | | | |
| **Additional questions for pump out system** (See Section 4.9 for further guidance)<br>*Note: if the pump out system is acting as an OSD system, please fill out the questions under the OSD section as well* | | | |
| What is the volume of the pump out system? | | | |
| What is the discharge rate per pump? | | | |
| Have at least two pumps been provided? | | | |

| Manual Requirements | Applicable (Yes/No) | State the value or (Yes/ No) where applicable | If no, please provide a reason |
|---|---|---|---|
| **Additional questions for pump out system** | | | |
| Are the pumps operating alternatively or one duty and one standby? | | | |
| Does the collection system for the pump out system incorporate buffer storage as recommended by the pump manufacturer or a suitably qualified practitioner? | | | |
| What is the additional storage volume provided? | | | |
| Has consideration of the consequences of a power failure been made when sizing the buffer storage? | | | |
| Is an alarm system comprising of basement pump-out failure warning sign together with a flashing strobe light and siren installed at a clearly visible location at the entrance to the basement in case of pump failure provided? | | | |
| In the event of failure, is an overland flow path provided? | | | |
| Have full hydraulic details and pump manufacturers specifications been provided? | | | |
| Is the registered proprietor prepared to indemnify Council from all claims for damages arising from the failure of the pump system? | | | |
| **Ancillary (where applicable)** | | | |
| Is a maintenance schedule for the stormwater drainage system provided? | | | |
| Have you checked to see if a Council/Sydney Water owned stormwater pipe traverses the property or is within proximity to the site? | | | |
| If construction of new stormwater infrastructure within Council land is proposed, has a long section of the proposed pipeline been provided? | | | |
| Does the development require a rainwater reuse system as per BASIX or Section 7 of the WMTM? | | | |
| Have water quality targets been met (see Section 10 of WMTM for further guidance)? | | | |

## 15.4 ANNEXURE D – Example erosion & sediment control plan




**Note**

1. All erosion and sediment control measures to be inspected and maintained daily by site manager.
2. Minimise disturbed areas.
3. All stockpiles to be clear from drains, gutters and footpaths.
4. Drainage is to be connected to stormwater system as soon as possible.
5. Roads and footpath to be swept daily.
6. If you do not comply you may be liable to a $600 fine.

**Legend**

- Undisturbed vegetation
- Silt Fence
- Stockpiles
- Geotextile Fabric
- Fabric filled with gravel
- Stormwater pit

| Drawn By: Date: | Location: | Scale: | Applicant: |
|---|---|---|---|

(Source: Landcom, 2004)

## 15.5 ANNEXURE E – An example Positive Covenant/Restriction on Use of Land for an On-site Stormwater Detention System

**1. Terms on the Restriction on the Use of Land firstly referred to in the abovementioned plan.**

1.1 The registered proprietor shall not make or permit or suffer the making of any alterations to any on-site stormwater detention system which is, or shall be, constructed on the lot(s) burdened without the prior consent in writing of Council. The system is detailed on the plans approved by _____ as Construction Certificate No. _____ . A copy of this Construction Certificate is held on Council file Certificate No. _____ .

**For the purpose of this Restriction:**

The expression "on-site stormwater detention system" shall include all ancillary gutters, downpipes, pipes, drains, orifice plates, walls, earth banks, kerbs, pits, grates, tanks, basins, chambers, basins and other surfaces designed to temporarily detain water and control stormwater as well as surfaces graded to the on-site stormwater detention system on any part of the burdened lot(s).

"System" means any on-site stormwater detention system constructed on the lot(s) burdened.

"Proprietor" includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

"Council" means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

**2. Terms of the Positive Covenant secondly referred to in the abovementioned plan.**

The system is detailed on the plans approved by _____ as Construction Certificate No. _____ . A copy of this Construction Certificate is held on Council file Certificate No. _____ .

2.1 The registered proprietor of the lot(s) hereby burdened will in respect of the system:

a) regularly keep the system clean and free from grass clippings, silt, rubbish and debris and the like;

b) maintain, repair and replace at the sole expense of the registered proprietor the whole of the system or any part of it due to deterioration or damage without delay so that it functions in a safe and efficient manner;

c) must keep records of such maintenance and repairs by a suitably qualified professional and must make these available to Council upon request

d) permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at a time and without notice in the case of an emergency) to enter and inspect the land for condition of the device and the state of construction, maintenance or repair of the device, for the compliance with the requirements of this covenant; and

e) comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2.2 Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with said notice referred to in part 2.1 (e) above; and

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(i) any expenses reasonably incurred by it exercising its power under sub-paragraph 2.2 (a) hereof. Such expense shall include reasonable wages for Council's employees engaged in effecting the work referred to 2.2 (a) above, supervising and administering the said work together with costs reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work.

(ii) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act of providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act.

**For the purpose of this Covenant:**

The expression **"on-site stormwater detention system"** shall include all ancillary gutters, downpipes, pipes, drains, orifice plates, walls, earth banks, kerbs, pits, grates, tanks, basins, chambers, basins and other surfaces designed to temporarily detain water and control stormwater as well as surfaces graded to the on-site stormwater detention system on any part of the burdened lot(s).

**"System"** means any on-site stormwater detention system constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

## 15.6 ANNEXURE F – An example positive covenant greywater treatment systems template

Instrument setting out the terms of Easements or Profits ă Prendre intended to be created or released and of Restrictions on the Use of Land or Positive Covenants intended to be created pursuant to Section 88B and Section 88E of the Conveyancing Act 1919.

### Plan

Plan of Subdivision of Lot _____ DP _____ covered by Council's Certificate No. _____ of

Full name and address of the owner of the land _____ .

### Part 1 (Creation)

| Number of item in the intention panel on the plan | Identity of easement, profit ă prendre, restriction or positive covenant to be created and referred to in the plan | Burdened lot(s) or parcel(s): | Benefited lot(s), road(s), bodies or Prescribed Authorities: |
|---|---|---|---|
| 1 | Public Positive Covenant | | Waverley Council |

### Part 2 (Terms)

Terms of easement, profit ă prendre, restriction, or positive covenant numbered 1 in the plan:

Positive Covenant

Pursuant to section 88E of the Conveyancing Act 1919 the registered proprietor(s) of the lot(s) burdened with respect to Greywater Treatment Systems ("the System") described in Plan No _____ dated _____ (Council's File Ref_____ Held in the offices of Waverley Council ("the Council"), 55 Spring Street, Bondi Junction, NSW, shall at the sole expense of the registered proprietor of the burdened lot:

a) Maintain, repair and take all necessary measures as to the System for the continued safe and efficient operation of the System including but not limited to those referred to in the Water Management Technical Guidelines prepared and published by Council from time to time so far as they relate to Blackwater Treatment Systems to provide that the system functions in a safe and efficient manner;

b) Comply with any requirements of Sydney Water as to the maintenance and repair of the System and all necessary measures to prevent inefficient operation of the System;

c) Comply with the requirements of Government policies and protocols as to the installation, maintenance and repair of the System including requirements of the Department of Health NSW;

d) Comply with the terms of any written notice issued by Waverley Council in respect of the requirements of this Covenant within the stated in such notice;

e) Obtain and maintain Department of Health NSW Accreditation as is applicable to the system from time to time.

f) Allow for the Council to require the system to cease operating and direct all wastewater to the sewer in the event of a systems failure;

g) Allow upon reasonable notice the Council to access the burdened land and inspect the system and if necessary carry out works that are required.

h) Pursuant to section 88(F) of the Conveyancing Act 1919 allow the Council to have the following additional powers pursuant to this covenant:

(i) In the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant the Council or its authorised agents may enter the land with all necessary equipment and carry out any work which the Council in its discretion considers reasonable to comply with the said notice referred to in (d);

(ii) The Council may recover from the registered proprietor in a Court of competent jurisdiction:

1. Any expense reasonably incurred by it in exercising its powers under clause (i) such expense shall include reasonable wages for the Council's own employees engaged in effecting the said work, supervising the said work and administering the said work together with costs, reasonably estimated by the Council, for the use of machinery, tools and equipment in conjunction with the said work.
2. Legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Conveyancing Act 1919 or providing any certificate required pursuant to section 88G of the Conveyancing Act 1919 or obtaining any injunction pursuant to section 88H of the Conveyancing Act 1919.

i) This covenant shall bind all persons who claim under the registered proprietor(s) as stipulated in section 88E(5) of the Conveyancing Act 1919.

NAME OF AUTHORITY EMPOWERED TO RELEASE, VARY OR MODIFY THE POSITIVE COVENANT REFERRED TO IS WAVERLEY COUNCIL

| | |
|---|---|
| Signature of Witness | Waverley Council by its Attorney pursuant to Power of Attorney Book No. |
| Full name of Witness (BLOCK LETTERS) | Signature |
| Address of Witness | |

## 15.7 ANNEXURE G – An example positive covenant blackwater treatment system template

Instrument setting out the terms of Easements or Profits ă Prendre intended to be created or released and of Restrictions on the Use of Land or Positive Covenants intended to be created pursuant to Section 88B and Section 88E of the Conveyancing Act 1919.

### Plan

Plan of Subdivision of Lot _____ DP _____ covered by Council's Certificate No. _____ of

Full name and address of the owner of the land _____ .

### Part 1 (Creation)

| Number of item in the intention panel on the plan | Identity of easement, profit ă prendre, restriction or positive covenant to be created and referred to in the plan | Burdened lot(s) or parcel(s): | Benefited lot(s), road(s), bodies or Prescribed Authorities: |
|---|---|---|---|
| 1 | Public Positive Covenant | | Waverley Council |

### Part 2 (Terms)

Terms of easement, profit ă prendre, restriction, or positive covenant numbered 1 in the plan:

Positive Covenant

Pursuant to section 88E of the Conveyancing Act 1919 the registered proprietor(s) of the lot(s) burdened with respect to Greywater Treatment Systems ("the System") described in Plan No _____ dated _____ (Council's File Ref_____ Held in the offices of Waverley Council ("the Council"), 55 Spring Street, Bondi Junction, NSW, shall at the sole expense of the registered proprietor of the burdened lot:

a) Maintain, repair and take all necessary measures as to the System for the continued safe and efficient operation of the System including but not limited to those referred to in the Water Management Technical Guidelines prepared and published by Council from time to time so far as they relate to Blackwater Treatment Systems to provide that the system functions in a safe and efficient manner;

b) Comply with any requirements of Sydney Water as to the maintenance and repair of the System and all necessary measures to prevent inefficient operation of the System;

c) Comply with the requirements of Government policies and protocols as to the installation, maintenance and repair of the System;

d) Comply with the terms of any written notice issued by Waverley Council in respect of the requirements of this Covenant within the stated in such notice;

e) Allow for the Council to require the system to cease operating and direct all wastewater to the sewer in the event of a systems failure;

f) Allow upon reasonable notice the Council to access the burdened land and inspect the system and if necessary carry out works that are required.

g) Pursuant to section 88(F) of the Conveyancing Act 1919 allow the Council to have the following additional powers pursuant to this covenant:

(i) In the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant the Council or its authorised agents may enter the land with all necessary equipment and carry out any work which the Council in its discretion considers reasonable to comply with the said notice referred to in (d);

(ii) The Council may recover from the registered proprietor in a Court of competent jurisdiction:

1. Any expense reasonably incurred by it in exercising its powers under clause (i) such expense shall include reasonable wages for the Council's own employees engaged in effecting the said work, supervising the said work and administering the said work together with costs, reasonably estimated by the Council, for the use of machinery, tools and equipment in conjunction with the said work.
2. Legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Conveyancing Act 1919 or providing any certificate required pursuant to section 88G of the Conveyancing Act 1919 or obtaining any injunction pursuant to section 88H of the Conveyancing Act 1919.

h) This covenant shall bind all persons who claim under the registered proprietor(s) as stipulated in section 88E(5) of the Conveyancing Act 1919.

NAME OF AUTHORITY EMPOWERED TO RELEASE, VARY OR MODIFY THE POSITIVE COVENANT REFERRED TO IS WAVERLEY COUNCIL

| | |
|---|---|
| Signature of Witness | Waverley Council by its Attorney pursuant to Power of Attorney Book No. |
| Full name of Witness (BLOCK LETTERS) | Signature |
| Address of Witness | |

## 15.8 ANNEXURE H – An example Positive Covenant/Restriction on Use of Land for a Stormwater Quality Improvement Device (SQID)

**1. Terms on the Restriction on the Use of Land firstly referred to in the abovementioned plan.**

1.1 The registered proprietor(s) shall not make or permit or suffer the making of any alterations to any Stormwater Quality Improvement Device, which is, or shall be, constructed on the lot(s) burdened without the prior consent in writing of Council. The system is detailed on the plans approved by _____ as Construction Certificate No. _____ . A copy of this Construction Certificate is held on Council file Certificate No. _____ .

**For the purpose of this Restriction:**

The expression **"Stormwater Quality Improvement Device"** means the _____ (e.g. Humeceptor), and shall include all ancillary gutters, downpipes, pipes, drains, walls, kerbs, pits, grates, tanks, chambers, basins and surfaces designed to treat stormwater, as well as all surfaces graded to the Stormwater Quality Improvement Device on any part of the burdened lot(s).

**"System"** means any Stormwater Quality Improvement Device constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

**2. Terms of the Positive Covenant secondly referred to in the abovementioned plan.**

The system is detailed on the plans approved by _____ as Construction Certificate No. _____ . A copy of this Construction Certificate is held on Council file Certificate No. _____ .

2.1 The registered proprietor of the lot(s) hereby burdened will in respect of the system:

a) regularly keep the system clean and free from grass clippings, silt, rubbish and debris and the like;

b) maintain, repair and replace at the sole expense of the registered proprietor the whole of the system or any part of it due to deterioration or damage without delay so that it functions in a safe and efficient manner, in accordance with the manufacturer's recommended requirements and/or the "Maintenance Schedule" prepared by _____ on _____ , a copy of which is held on Council File _____ A copy of this Schedule is available to all owners and occupiers of the burdened lot(s)

c) must keep records of such maintenance and repairs by a suitably qualified professional and must make these available to Council upon request

d) permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at a time and without notice in the case of an emergency) to enter and inspect the land for condition of the device and the state of construction, maintenance or repair of the device, for compliance with the requirements of this covenant; and

e) comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2.2 Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with said notice referred to in part 2.1 (e) above; and

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(i) any expenses reasonably incurred by it exercising its power under sub-paragraph 2.2 (a) hereof. Such expense shall include reasonable wages for Council's employees engaged in effecting the work referred to 2.2 (a) above, supervising and administering the said work together with costs reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work.

(ii) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act of providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act.

**For the purpose of this Covenant:**

The expression ""**"Stormwater Quality Improvement Device"** means the _____ (e.g. Humeceptor), and shall include all ancillary gutters, downpipes, pipes, drains, walls, kerbs, pits, grates, tanks, chambers, basins and surfaces designed to treat stormwater, as well as all surfaces graded to the Stormwater Quality Improvement Device on any part of the burdened lot(s).

**"System"** means any Stormwater Quality Improvement Device constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

## 15.9 ANNEXURE I – An example Positive Covenant/Restriction on Use of Land for a Pump Out System

**1. Terms on the Restriction on the Use of Land firstly referred to in the abovementioned plan.**

1.1 The registered proprietor shall not make or permit or suffer the making of any alterations to any pump out system which is, or shall be, constructed on the lot(s) burdened without the prior consent in writing of Waverley Council. The system is detailed on the plans approved by _____ as Construction Certificate No. _____ . A copy of this Construction Certificate is held on Council file No. _____ .

**For the purpose of this Restriction:**

The expression **"pump out system"** shall include all ancillary gutters, downpipes, pipes, drains, walls, kerbs, pits, grates, tanks, pumps, fittings, electrical works, chambers, basins and other surfaces designed to temporarily detain water and control stormwater as well as surfaces graded to the pump out system on any part of the burdened lot(s).

"System" means any pump out system constructed on the lot(s) burdened.

"Proprietor" includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

"Council" means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

**2. Terms of the Positive Covenant secondly referred to in the abovementioned plan.**

The system is detailed on the plans approved by _____ as Construction Certificate No. _____ . A copy of this Construction Certificate is held on Council file No. _____ .

2.1 The registered proprietor of the lot(s) hereby burdened will in respect of the system:

a) regularly keep the system clean and free from grass clippings, silt, rubbish and debris and the like;

b) maintain, repair and replace at the sole expense of the registered proprietor the whole of the system or any part of it due to deterioration or damage without delay so that it functions in a safe and efficient manner;

c) must keep records of such maintenance and repairs by a suitably qualified professional and must make these available to Council upon request

d) permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at a time and without notice in the case of an emergency) to enter and inspect the land for condition of the device and the state of construction, maintenance or repair of the device, for the compliance with the requirements of this covenant; and

e) comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2.2 Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with said notice referred to in part 2.1 (e) above; and

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(iii) any expenses reasonably incurred by it exercising its power under sub-paragraph 2.2 (a) hereof. Such expense shall include reasonable wages for Council's employees engaged in effecting the work referred to 2.2 (a) above, supervising and administering the said work together with costs reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work.

(iv) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act of providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act.

**For the purpose of this Covenant:**

The expression **"pump out system"** shall include all ancillary gutters, downpipes, pipes, drains, walls, kerbs, pits, grates, tanks, pumps, fittings, electrical works, chambers, basins and other surfaces designed to temporarily detain water and control stormwater as well as surfaces graded to the pump out system on any part of the burdened lot(s).

**"System"** means any pump out system constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

## 15.10 ANNEXURE J – An example Positive Covenant/Restriction on Use of Land for an Infiltration System

**1. Terms on the Restriction on the Use of Land firstly referred to in the abovementioned plan.**

1.1 The registered proprietor shall not make or permit or suffer the making of any alterations to any infiltration system which is, or shall be, constructed on the lot(s) burdened without the prior consent in writing of Council.
The system is detailed on the plans approved by _____ as Construction Certificate No. _____ .
A copy of this Construction Certificate is held on Council file No. _____ .

**For the purpose of this Restriction:**

The expression "**infiltration system**" shall include all ancillary gutters, downpipes, pipes, drains, walls, kerbs, pits, grates, tanks, chambers, basins and surfaces designed to direct water to the infiltration system on any part of the burdened lot(s).

"System" means any infiltration system constructed on the lot(s) burdened.

"Proprietor" includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

"Council" means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

**2. Terms of the Positive Covenant secondly referred to in the abovementioned plan.**

The system is detailed on the plans approved by _____ as Construction Certificate No. _____ .
A copy of this Construction Certificate is held on Council file No. _____ .

2.1 The registered proprietor of the lot(s) hereby burdened will in respect of the system:

a) regularly keep the system clean and free from grass clippings, silt, rubbish and debris and the like;

b) maintain, repair and replace at the sole expense of the registered proprietor the whole of the system or any part of it due to deterioration or damage without delay so that it functions in a safe and efficient manner;

c) must keep records of such maintenance and repairs by a suitably qualified professional and must make these available to Council upon request

d) permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at a time and without notice in the case of an emergency) to enter and inspect the land for condition of the device and the state of construction, maintenance or repair of the device, for the compliance with the requirements of this covenant; and

e) comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2.2 Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with said notice referred to in part 2.1 (e) above; and

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(v) any expenses reasonably incurred by it exercising its power under sub-paragraph 2.2 (a) hereof. Such expense shall include reasonable wages for Council's employees engaged in effecting the work referred to 2.2 (a) above, supervising and administering the said work together with costs reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work.

(vi) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act of providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act.

**For the purpose of this Covenant:**

The expression **"infiltration system"** shall include all ancillary gutters, downpipes, pipes, drains, walls, kerbs, pits, grates, tanks, chambers, basins and surfaces designed to direct water to the infiltration system on any part of the burdened lot(s).

**"System"** means any infiltration system constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

## 15.11 ANNEXURE K – An example Positive Covenant/Restriction on Use of Land for an Overland Flow Path

**1. Terms on the Restriction on the Use of Land firstly referred to in the abovementioned plan.**

1.1 The registered proprietor(s) shall not make or permit or suffer the making of any alterations to the overland flow path, which is on the lot(s) burdened and identified in the report, prepared and certified by _____ , Reference No _____ , dated _____ and approved under Development Consent No. _____ , without the prior consent in writing of Council.

**For the purpose of this Restriction:**

The expression **"overland flow path"** shall include all ancillary pipes, drains, walls, kerbs, pits, grates and surfaces designed to convey the overland flow path through the site.

**"System"** means any overland flow path constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

**2. Terms of the Positive Covenant secondly referred to in the abovementioned plan.**

The overland flow path, which is on the lot(s) burdened and identified in the report, prepared and certified by _____ , Reference No _____ , dated _____ and approved under Development Consent No. _____ .

2.1 The registered proprietor of the lot(s) hereby burdened will in respect of the overland flow path:

a) Regularly keep the overland flow path clean and free from grass clippings, silt, rubbish and debris and the like;

b) maintain the overland flow path clear from any obstructions at the sole expense of the registered proprietor so that if functions in a safe and efficient manner;

c) permit the Council or its authorised agents from time to time and upon giving reasonable notice (but at a time and without notice in the case of an emergency) to enter and inspect the land for compliance with the requirements of this covenant; and

d) comply with the terms of any written notice issued by the Council in respect of the requirements of this covenant within the time stated in the notice.

2.2 Pursuant to Section 88F (3) of the Conveyancing Act 1919 the Council shall have the following additional powers:

a) in the event that the registered proprietor fails to comply with the terms of any written notice issued by the Council as set out above the Council or its authorised agents may enter the land with all necessary materials and equipment and carry out any work which the Council in its discretion considers reasonable to comply with said notice referred to in part 2.1 (d) above; and

b) the Council may recover from the registered proprietor in a Court of competent jurisdiction:

(i) any expenses reasonably incurred by it exercising its power under sub-paragraph 2.2 (a) hereof. Such expense shall include reasonable wages for Council's employees engaged in effecting the work referred to 2.2 (a) above, supervising and administering the said work together with costs reasonably estimated by the Council, for the use of materials, machinery, tools and equipment in conjunction with the said work.

(ii) legal costs on an indemnity basis for issue of the said notices and recovery of the said costs and expenses together with the costs and expenses of registration of a covenant charge pursuant to section 88F of the Act of providing any certificate required pursuant to section 88G of the Act or obtaining any injunction pursuant to section 88H of the Act.

**For the purpose of this Covenant:**

The expression **"overland flow path"** shall include all ancillary pipes, drains, walls, kerbs, pits, grates and surfaces designed to convey the overland flow path through the site.

**"System"** means any overland flow path constructed on the lot(s) burdened.

**"Proprietor"** includes the registered proprietor of the burdened lot from time to time and all heirs, executors, assigns and successors in title to the burdened lot and where there are two or more registered proprietors of the burdened lot the terms of this Positive Covenant will bind all those registered proprietors jointly and severally.

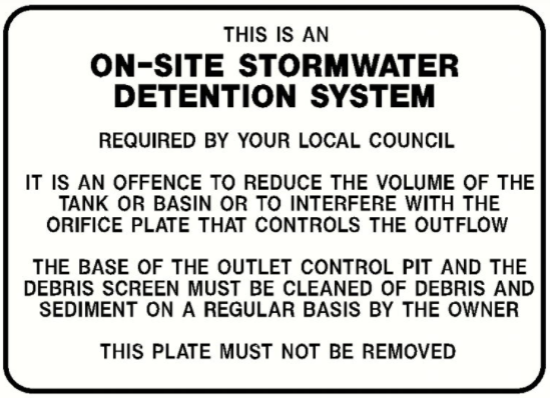
**"Council"** means the Waverley Council or its successor.

Name of Authority having the power to release, vary or modify the Restriction referred to is Waverley Council.

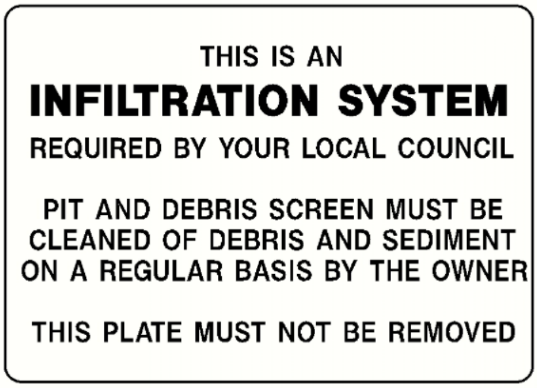
## 15.12 ANNEXURE L – Example Warning Signs

Standard OSD Warning Sign


OSD Signage

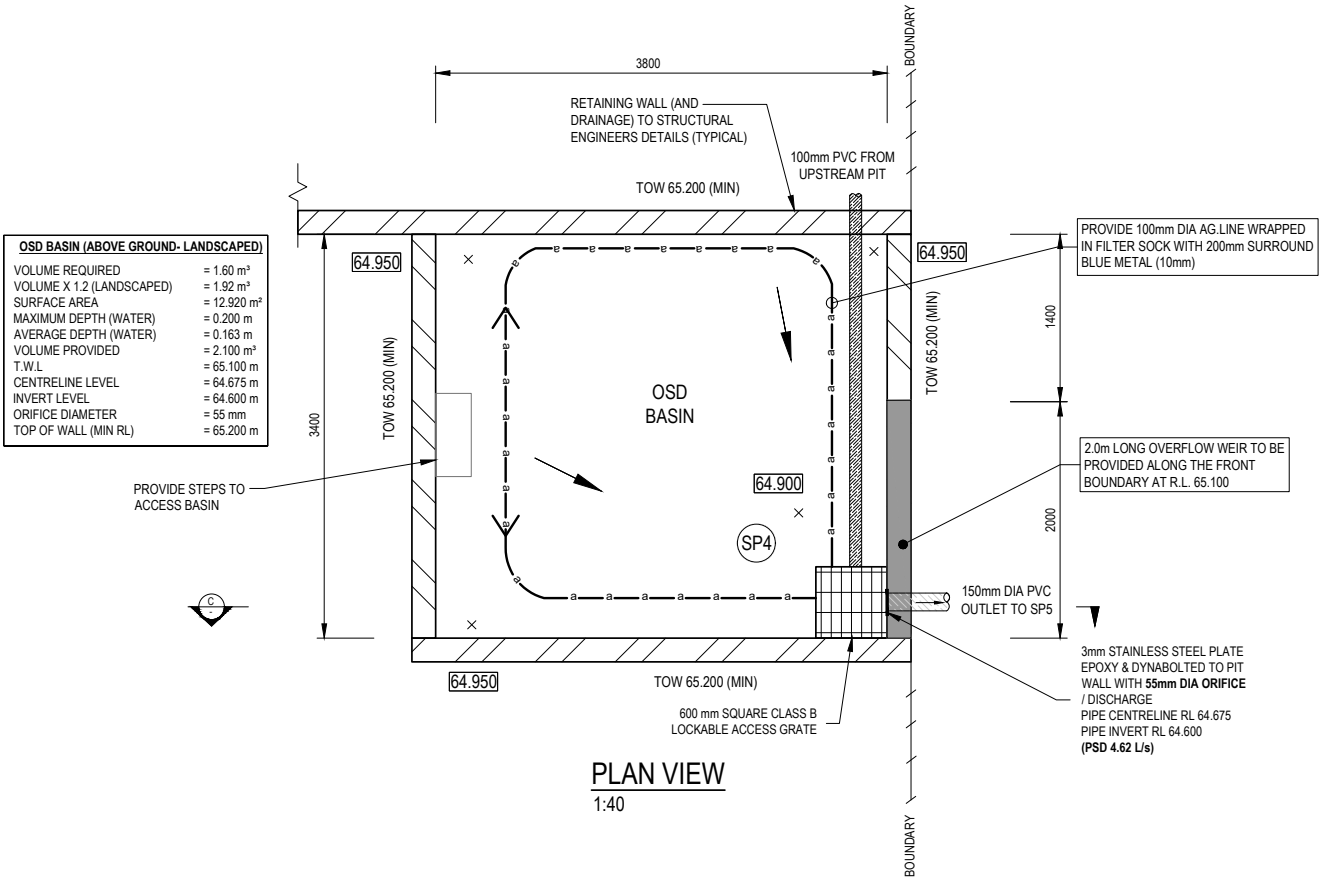


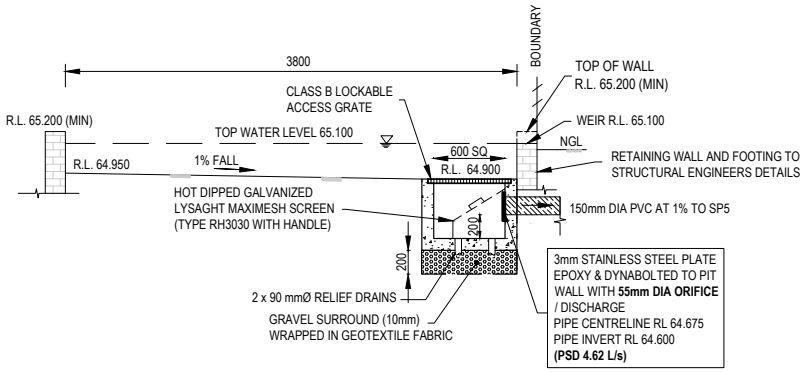

Absorption System Signage

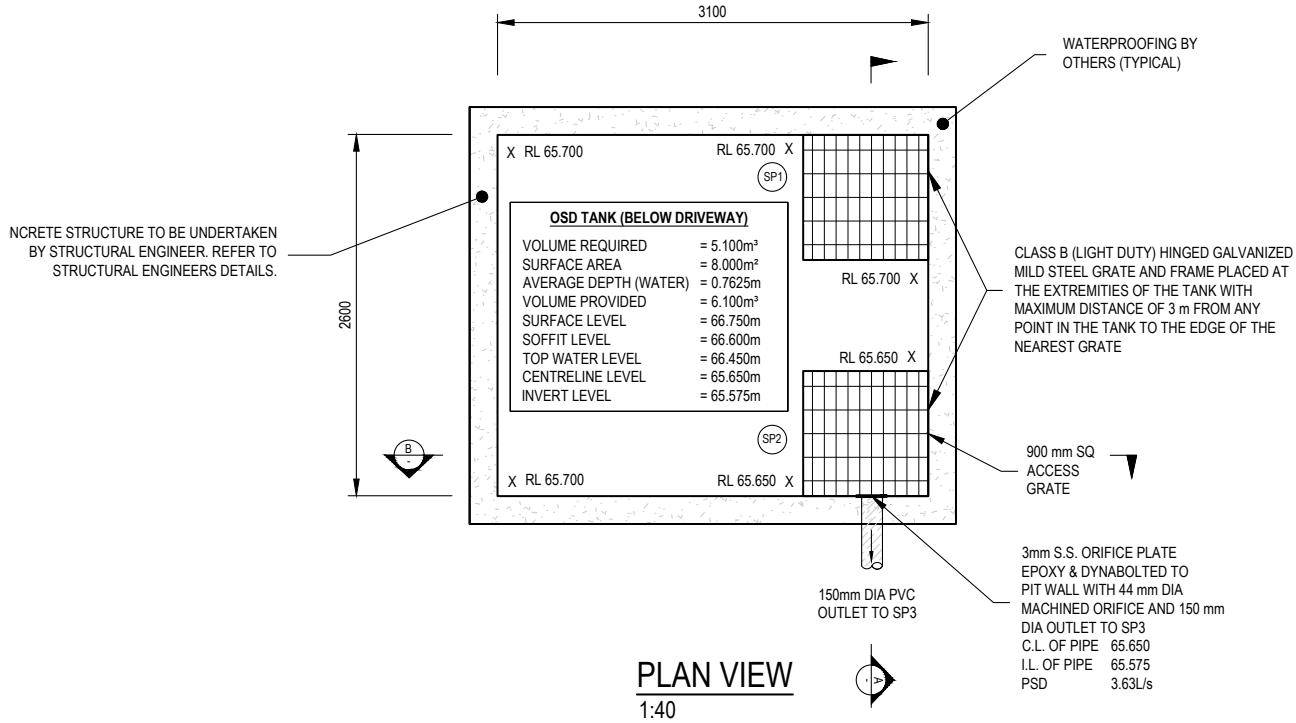



Confined Space Sign

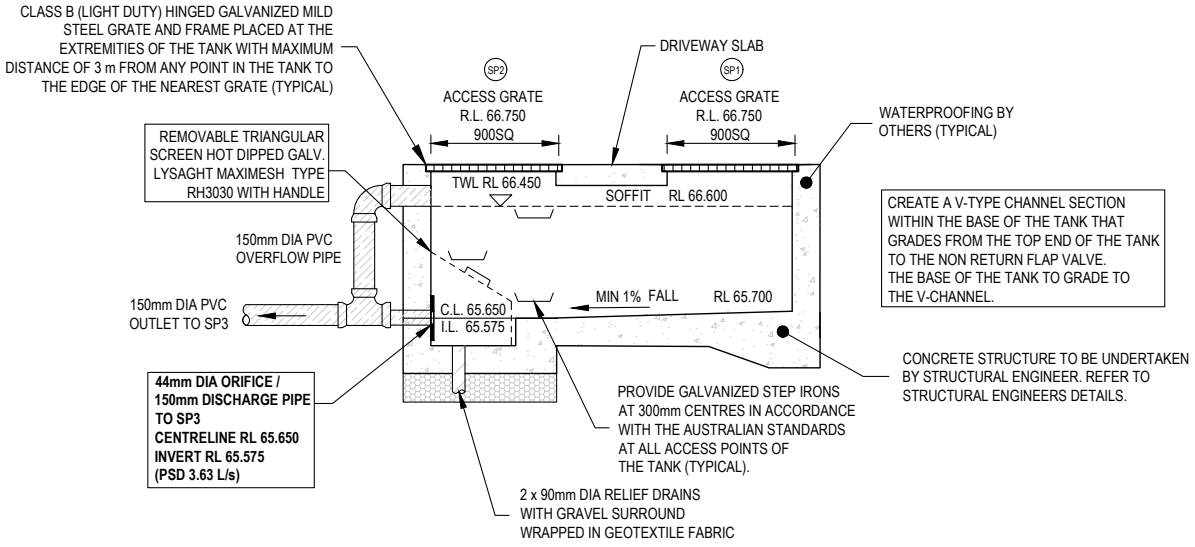
## 15.13 ANNEXURE M – Example OSD drawings



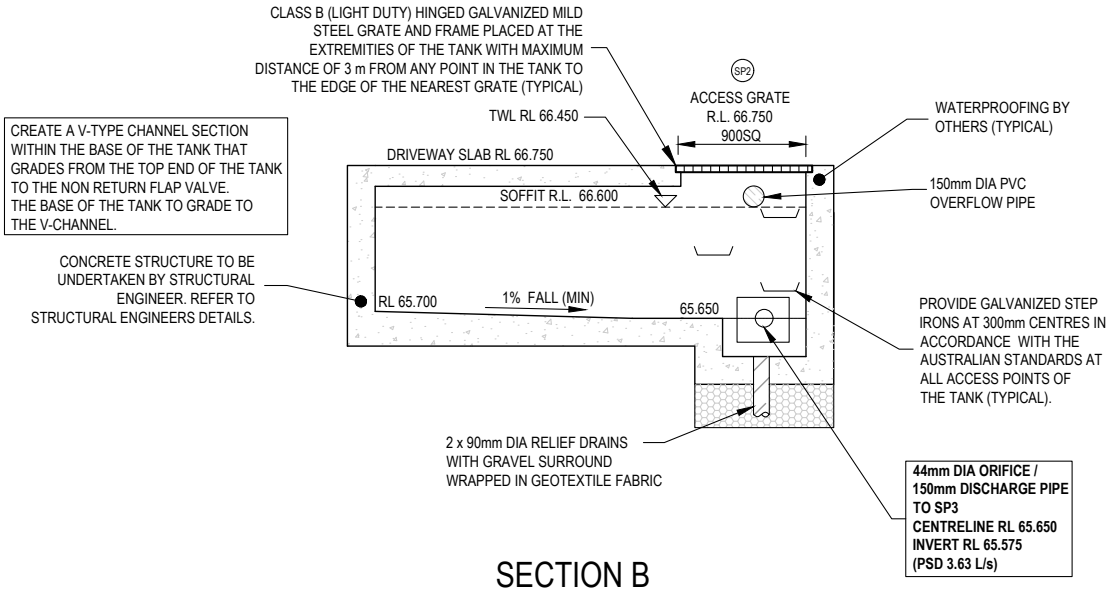






PLAN VIEW
1:40




SECTION A
1:40




SECTION B

1:40

## 15.14 ANNEXURE N – Example Easement letter

Dear _____

I/We _____

are proposing to redevelop our property at _____

Before we can proceed with this proposal Council has advised us that we have two options for the drainage of stormwater, the first, which is Council's preferred method, is to obtain a drainage easement to convey the stormwater runoff from our property to the nearest public stormwater drainage infrastructure or Council approved discharge point, being _____ .

This will require you to grant me/us a drainage easement through your property with all legal and survey costs for the creation of the easement being borne by us, together with any consideration for the use of your property as determined by an independent valuation or agreement. (Attach independent valuation or agreement to this form).

One alternative is to install an underground absorption system or level spreader (if appropriate for this site) to spread and disperse the stormwater flow. As the runoff and seepage from this system may flow towards your property because of the slope of the land, the best solution would be to have a drainage system that will convey our stormwater via an interallotment drainage pipe to _____ .

The other alternative is to install a pump out system. If the pump out system fails due to a power outage, any overflow may enter your property. This may lead to various issues, and so, the best solution would be to have a drainage system that will convey our stormwater via an interallotment drainage pipe to _____ .

You are advised that if Council determines that the only way for the drainage of stormwater is via an easement through your property, I/we may have to use Section 88K of the Conveyancing Act 1919 to request the Supreme Court to grant me/us the drainage easement. This will probably result in legal expenses and time spent for both you and I/us.

Could you please indicate your position regarding this matter so that we can advise Council to enable our application to progress.

| Yes I/we are willing to grant you a drainage easement |
|---|
| Full name (BLOCK LETTERS) |
| Address |

| No I/we are not willing to grant you a drainage easement |
|---|
| Reason for refusal |
| Full name (BLOCK LETTERS) |
| Address |